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Railway-Shop Work at Sagua

By Fred H. Colvin
Editor, American Machinist

Some of the machine equipment and shop-made devices that help to keep locomotives in service on an interior division in a sugar district of one of the Cuban railways

KEEPING locomotives in repair at a remote division point of a non-industrial country involves problems with which the railway officials in thickly settled industrial countries are entirely unfamiliar. A division point of this kind is to be found at Sagua la Grande, in the Province of Santa Clara, Cuba, where H. A. W. Langdon and his assistant, David Renfrew, are in charge. The shops have been in existence many years, but the roundhouse is new, as indicated in Fig. 1. It is of steel construction, the steel being protected by a substantial coating of concrete, and, on account of having no cold weather, the building is open at the end and on the inside toward the turntable. Storage bins for scrap are at the left, while at the right is a tender frame undergoing straightening or repairs in which a portable oxyacetylene welding outfit is playing its part. While the machine shop contains many old machine tools, both the old Pond and Putnam makes being in evidence, there are also a number of modern machines, as shown in Figs. 2 and 3. That the shop executives are fully aware of the desirability of new machine equipment is indicated by their requisitions for several machines of the latest types. In Fig. 2 is a Bullard vertical turret lathe used in turning piston heads and fitting them to the piston rods. The turret slide on the cross-rail is set at the desired angle to bore the proper taper, so that the piston can be nearly completed at a single setting. The method of fitting the piston rod is clearly shown. The rod is suspended from a chain block on the jib crane, which serves both the Bullard and Morton machines shown in Figs. 2 and 3. In this way the piston rod can easily be lowered into the tapered hole bored in the piston, and the fit determined before the piston is removed from the table. While this is, of course, only one of the many jobs handled on this machine, it shows one of its applications. This view also gives an idea of the shop construction used in this country, showing the corrugated metal roofing, the skylight and the general bracing of the column structure. Across the aisle is a Morton draw-cut shaper at work on a driving box, planing it for shoes and wedges, Fig. 3. The driving box is mounted on the angle plate *A*, which enables it to be readily located in its proper position, and the box is held at three points by the straps *B*, *C* and *D*. Strap *B* holds the box against the table, while straps *C* and *D* clamp it down against the angle plate. In the latter case, the use of the block *E* avoids the necessity for having a special strap.

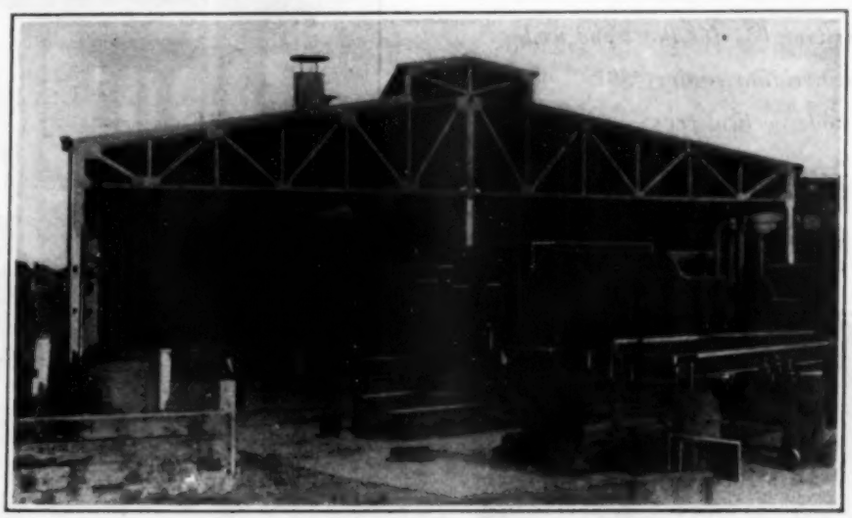
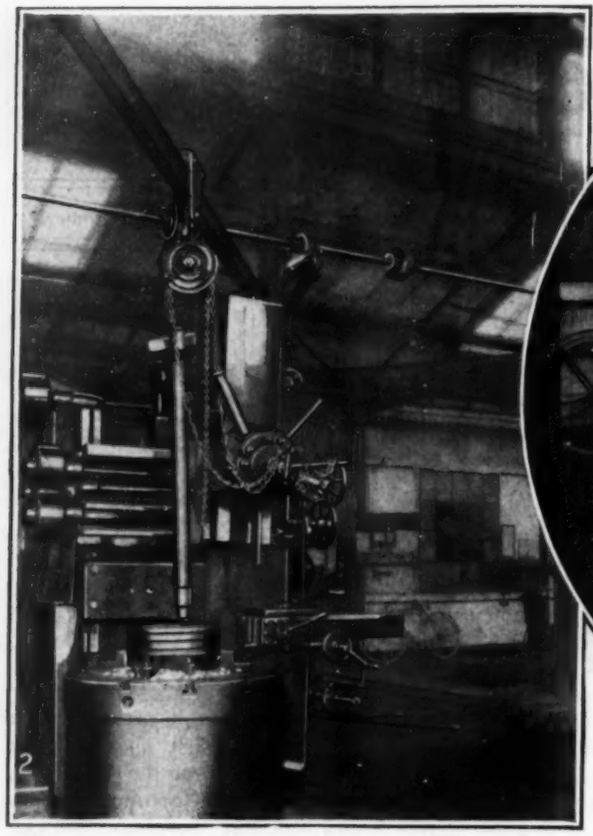
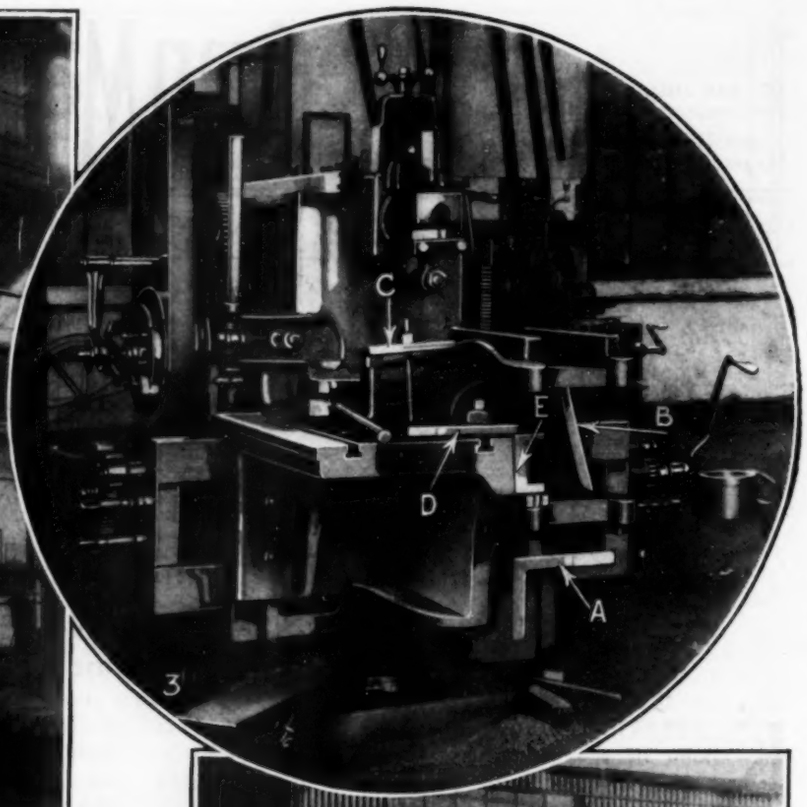


Fig. 1—End view of roundhouse structure

The flue department is made up of several units, some of them built in the Sagua shops. Oil is used for fuel in both the furnaces shown in Fig. 4. The ends of the flues are cut off in the small belt-driven machine shown in the center, while the safe-ends are welded on the





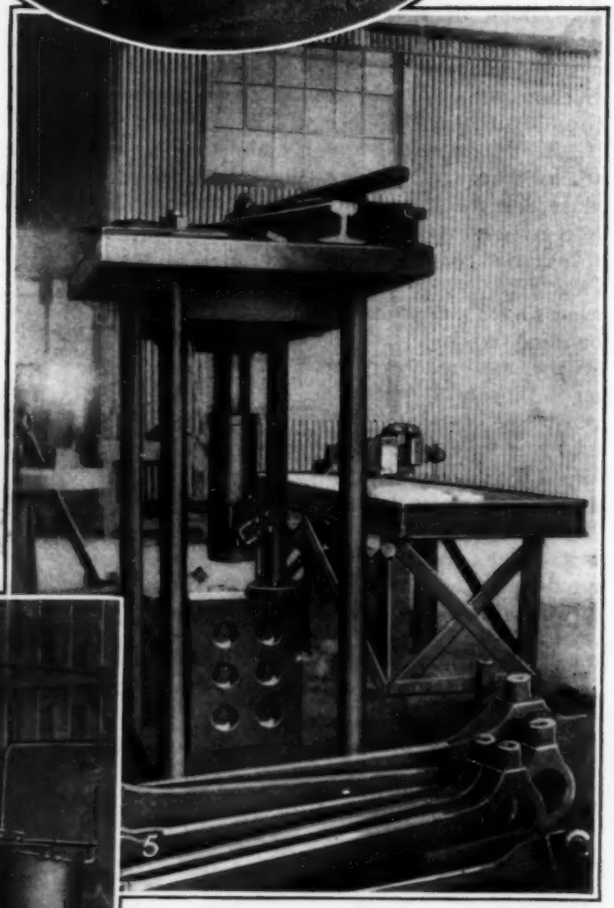
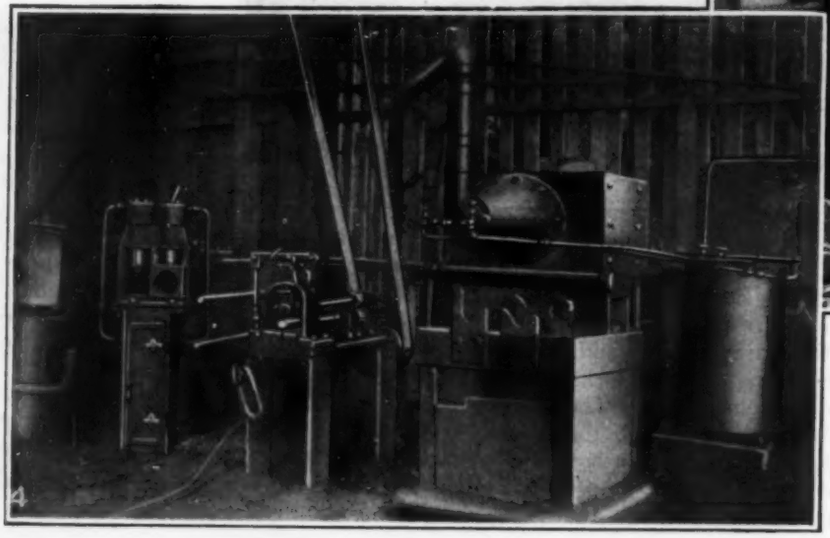


Fig. 2—Fitting piston rods in pistons

Fig. 3—Planing driving box for shoes and wedges

Fig. 4—Boiler-flue welding equipment

Fig. 5—A home-made vertical press



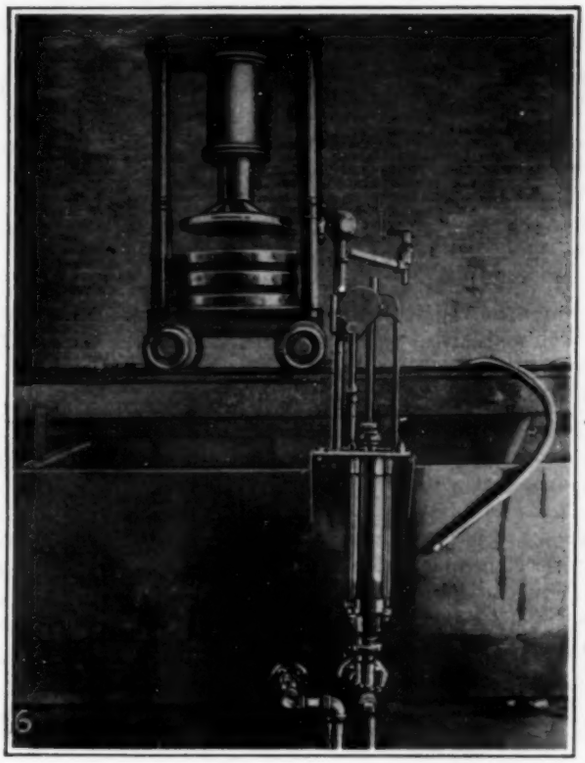


Fig. 6—Method of extracting oil from waste.

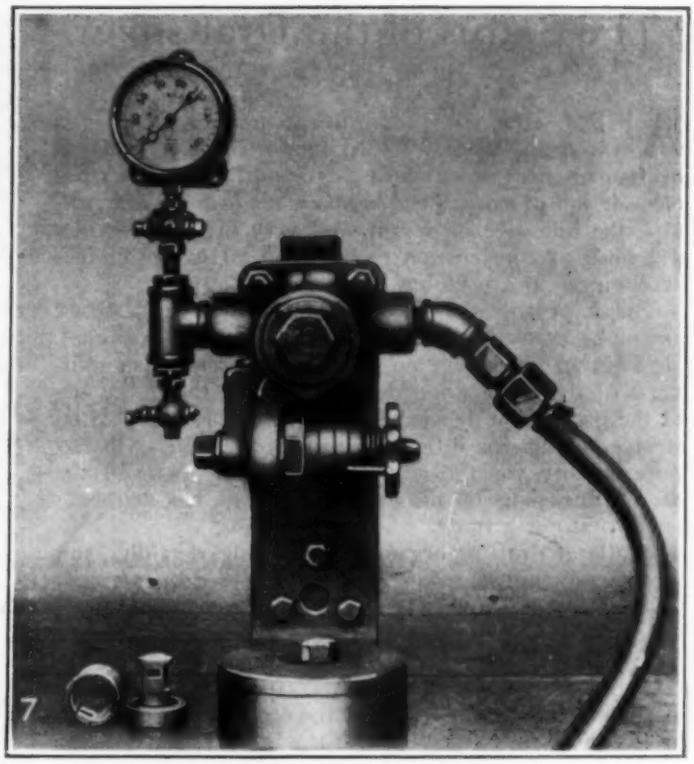


Fig. 7—Making a B-6 feed valve grind itself

flues in the double, pneumatic-hammer device shown at the left. This device is practically self-contained and is mounted on an old machine base, as can be seen from the hinged door. As the dies shown in the swaging hammer indicate, superheater flues are used on this road.

For pressing in rod brasses and similar work, the press shown in Fig. 5 has been rigged up. It consists of a hydraulic jack mounted upside down in the frame shown, the frame rods being embedded in concrete and the upper part supported by long thimbles which surround the rods. This press handles many kinds of work where considerable pressure is required. One of the work benches built up from flat, angle and channel steel is shown at the right.

Another type of press, and for an entirely different purpose, is shown in Fig. 6. This is an old air-brake cylinder fitted with a large plate on the end of the plunger, and is used in extracting oil from waste. The track on which it is mounted is over a metal lined tank from which the oil flows to a filter through the pipe outlet at the left, and is then drawn up through the Bowser pumping outfit shown as it is needed.

An ingenious device by which an air-brake B-6 feed valve is made to regrind itself is shown in Fig. 7. The valve mechanism is shown on the bench at the left beside the device. By admitting air pressure to the valve and then automatically relieving it by means of a spring loaded valve, the valve mechanism shown moves back and forth in the body and it only takes little experience to find how long it is necessary to leave the valve in position on the grinding stand.

Another air-brake grinding device is shown in Fig. 8, where two West bell-ringers are rigged up on a bench so as to automatically lap both valves of the triple valve shown. The handles on each end allow the mechanism to be moved by hand, but in actual operation it is only necessary to start the bell-ringer just as though it was on a locomotive, and it moves the valve back and forth as long as desired. Both of these devices should be of particular interest to air-brake men.

There was an unusual job in the shop, where a driving wheel had come loose due to a crack in the hub, extending from the bore to the opening between two of the spokes. This crack was being repaired by welding, the procedure being to chip away considerable metal each side of the crack to drill into the metal and to peg the holes with ¼-in. pins. Afterward the entire space between the pegs was filled in by arc welding, the pegging being common practice in using the arc to deposit metal on cast iron.

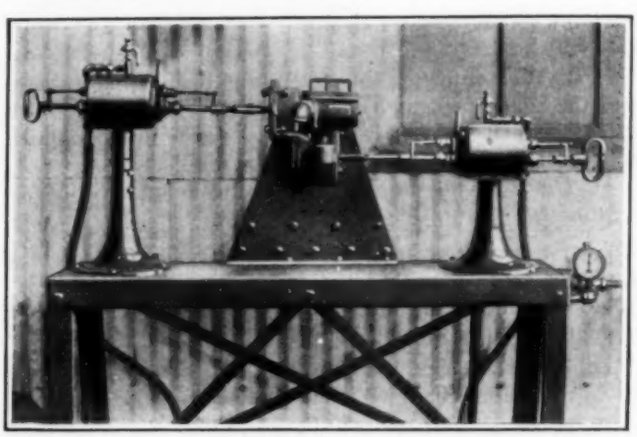


Fig. 8—Device for automatically lapping triple valves

It is always safer to buy a used machine from the maker or from one of his agents. They both want the machine to give satisfaction on account of the effect on the reputation of their product.

The Status of the Draftsman

By S. Martin

A FIRM advertises for a draftsman. What is a draftsman, anyhow? A number of years ago a draftsman was a man who was responsible for the complete design of a machine: he made his own calculations, took the initiative in design, and very often supervised the work of construction in the shop. He was in fact an engineer in everything except name.

Today organization and standardization to a great extent have relegated the draftsman to the background. He is in an unenviable position between the upper millstone of the engineering department, and the lower one of the production department, the shop. He very often receives credit for little and blame for much. He has responsibility for the accuracy of his layouts and the detail dimensions on his drawings but he has neither a profession nor a trade.

In a large drafting organization, tracing, detailing, and layout work are segregated, so that the word draftsman today covers a general class of men who may have very little to do with drawing. In some drafting rooms a new position, that of machine man, has been created. His duties consist of making tentative layouts of old machine parts assembled, and then performing a mass of clerical work connected with the issuing of drawings.

The following sketch is based on an actual experience, and is illustrative of the duties of a draftsman in a highly organized drafting room.

Formal Drafting

An old-fashioned draftsman's introduction to the system

Characters

Mr. J.	*Experienced draftsman fifty years of age.*
Squad Boss.	*Much harassed and overworked individual of thirty-five.*
Assistant foreman.	*Energetic young man recently promoted.*

Scene

Drafting room in a large manufacturing plant.

Squad Boss. *Coming hurriedly up to draftsman who has just passed through the ordeal of being hired and is sitting on a stool without a back, waiting to be given work.*

Here is a job Mr. J. Get out all of the drawings listed on this drawing list.

Draftsman. *Makes out charge slips and gets twelve drawings from the blueprint files.*

S. B. (*passing by 30 minutes later*) Well, have you got the drawings Mr. J.?

D. Yes, here they are. I had to go to several men in the section before I could locate all of them.

S. B. *(looking over drawings rapidly)* All right now go over to the card-catalog department and get a list of all the patterns made from this armature spider I have selected, and then get out all the drawings on which the pattern number appears.

D. *Gets out six more drawings and reports to S. B.*

S. B. (*spreads out drawings*) Can't use any of these Mr. J. Make a layout of the spider shown on this drawing, changing the end to fit the shaft as shown on this other print. Before you start, however, fill in Form 1 in triplicate, putting down the length of time you estimate that it will take to layout, detail, and check all of the parts necessary to complete the machine.

D. *After careful deliberation fills in form and lays it on foreman's desk.*

S. B. *(rushing over to draftsman's table a few minutes later.)* This won't do at all Mr. J., get me three more of these sheets.

D. *Gets sheets and S. B. makes out new estimate changing about half of the items.*

S. B. There Mr. J., now make out Form 2 in triplicate for a job number for this work, and let me have it together with two copies of Form 1, which I have just made out for you.

D. *Does so and starts to work on layout.*

S. B. (*about one hour later*) Mr. J., get out the drawing list for this job right away. Enter on the list all the parts that you can and then give it to the clerk to copy for you, check it carefully when it comes back and let me have it together with number card, three copies of Form 4 properly filled in, and also a key card filled in. You can get the key numbers from the key book which is somewheres around the section.

D. *Slightly nettled, does as instructed and starts again on the layout.*

S. B. *(some time later)* Mr. J. did you fill out Form 5 yet for a promise sheet? If not, do so right away.

D. *Slams down tools, fills out form and lays it on foreman's desk and starts layout again. Makes several mistakes, erases work, and starts over.*

S. B. *(stopping and looking over layouts)* All right Mr. J., go ahead and make a hand sketch of the spider and send it to the detail department to be detailed. Fill in Form 6 in duplicate and attach one copy to the sketch.

D. *Does so and then starts to do some checking.*

S. B. You will need a new outline for this job, Mr. J. Order a photo litho of the old tracing on Form 6 and when you receive it have the detail department make the necessary changes, check it, and turn it over to department C to have the connections added. Then fill out and attach form 7 in duplicate, and one sheet each of Forms 8 and 9. Attach them to the tracing together with the number card, on which is noted the time spent in detailing and checking, and turn all over to me.

D. *Completes this work and resumes checking.*

S. B. (*two days later*) Have you received the detail of the spider from the detail department yet Mr. J.?

D. (*with satisfaction*) Yes, I received it a few minutes ago.

S. B. Well enter the time spent on your estimate sheet, and the time spent and allowed on the drawing number card. Attach pattern card, change card, number card, and record print and let me have them.

D. *Does so and hopes that he will soon have some real drafting to do.*

Assistant Foreman. *(rushing over to draftsman a few minutes later with detail drawing in his hand.)* Mr. J. do you mean to state that it has taken 10 hours to make this change on this drawing?

D. (*weakly*) Yes, but only two hours were necessary to do the actual changing, the remainder of the time....

A. F. *(interrupting)* We want to know the exact time it has taken to make this change, so that we can find out why so much expense is incurred in making drawings.

Jigs and Fixtures for Oil Burners

By Frank W. Curtis
Western Editor, American Machinist

MAIN brackets for oil burners made by Hardinge Brothers, Chicago, Ill., have two $\frac{7}{8}$-in. rail holes, a $1\frac{5}{16}$-in. bearing hole, and a $\frac{9}{16}$-in. guide hole, drilled in them at one setting in the jig shown in Fig. 13. The operation is handled by first drilling the rail holes, then inserting the two plugs *A* through them prior to the drilling of the larger hole. The plugs add rigidity to the set-up, and insure alignment under the strain set up when feeding the three-lip drill through the work. Constructional details of the jig are illustrated in Fig. 14. The bracket is located by the V-block *B* and the locating pins *C*, *D* and *E*. All four means of location have adjustable features so that they can be reset to take care of variations in different batches of castings. The adjustment also permits taking up for wear. Clamping is done by two swinging arms. The one shown at the left has one clamping screw; the opposite one has two clamping screws. Additional clamping is obtained by the clamp *H*. These methods of locating and clamping are necessary, due to the peculiar shape of the bracket, and the example illustrates a well-worked out jig for such a part. As in a preceding example, the rail holes are used to locate the work for subsequent machining. The fixture illustrated in Fig. 15 is used for boring the bearing hole to 2 in., and for milling the two top pads of the brackets. The two plugs, shown in the front, pass through the bearings in the fixture and through the work. Two clamps, set at opposite ends of the fixture, hold the work in place. The projecting face of the bracket is supported by the screw jacks shown at the right. Inasmuch as the heights of the pads to be machined are different, it is necessary to adjust the spindle after one pad has been milled. Two set blocks are used for this purpose. The spindle adjustment is not changed for the next work-piece until after the pad it is adjusted for has been milled. In this way, but one change is required per piece. The machine used is a horizontal milling machine with a vertical milling attachment. Details of the fixture are shown in Fig. 16. At *A* are shown the two plugs, at *B* the clamps, and at *C* and *D* the pads that require milling. The jig

The second and concluding article.

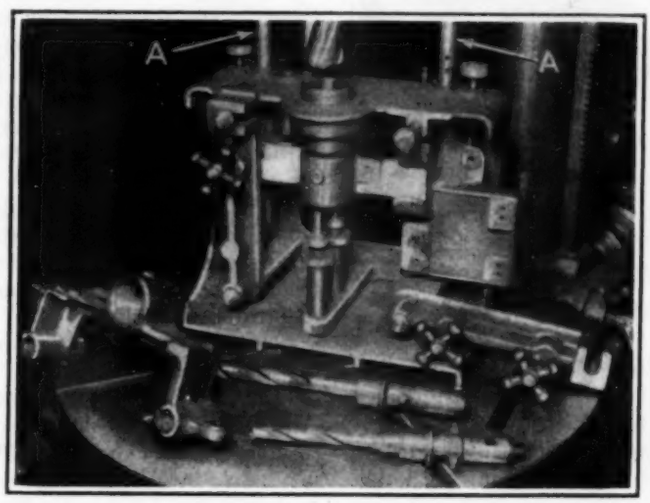
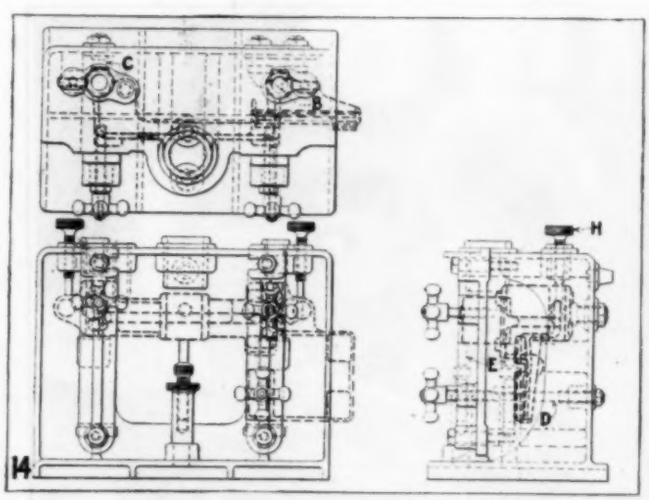


Fig. 13—Drill jig for main brackets



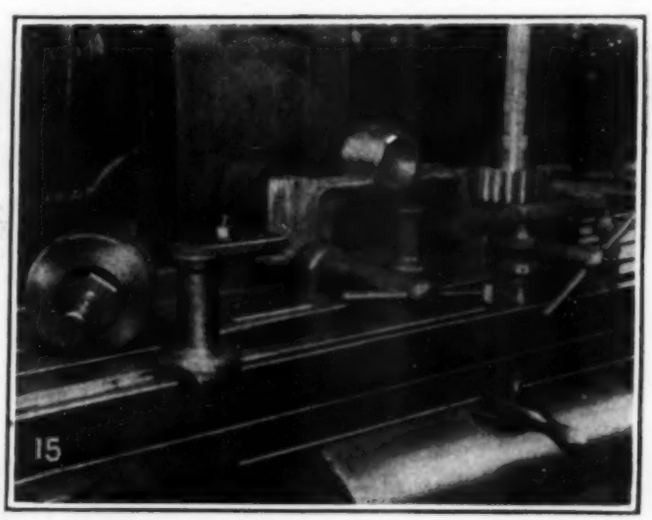


Fig. 14—Construction of the jig showing location point. *Fig. 15—Fixture for boring and milling the bracket*

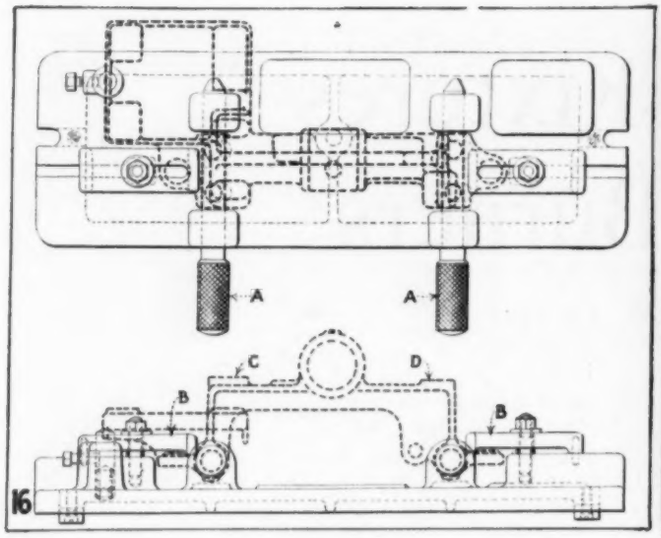


Fig. 16—Layout showing construction of the fixture.

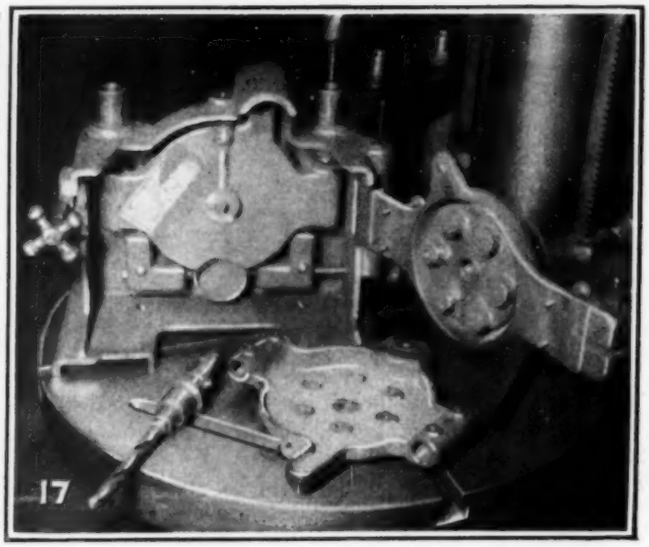


Fig. 17—Jig arranged for drilling holes from three sides

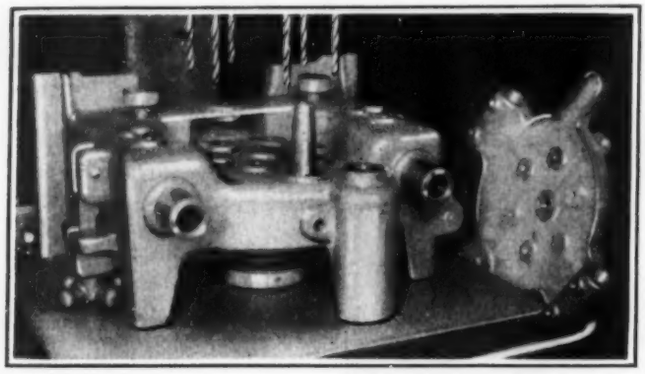


Fig. 18—Drilling a group of holes in the head base

for drilling the head base, illustrated in Fig. 17, is a good example of a turnover-type jig. Holes are drilled in the work from three sides, for which two drill presses are necessary. The illustration shows the jig open with the work in place. At this setting, two $\frac{7}{8}$-in. rail holes, one $\frac{29}{64}$-in. drain-pipe hole, one $\frac{29}{64}$-in. oil hole and four holes for setscrews are drilled. With the exception of the rail holes, all holes are later tapped. Then the jig is used as shown in Fig. 18 for drilling five holes in a circle, in which a multiple drill head is utilized. The practice is to run through a quantity of parts in one machine, after which the jig is transferred to the other machine. Constructional details of the jig are illustrated in Fig. 19. The head base is located by a plug that fits a previously drilled hole at *A*, and is located by the stop *B* and the adjustable screw *C*. Additional support is obtained by the two jacks *D* and *E*. A clamp in the leaf holds the work in place. The two rail holes are drilled first, after which the plugs *H* are inserted as shown. The walls of the jig are $\frac{3}{8}$ in. in thickness and are supported by ribs where necessary, thus making it light in weight in order to facilitate handling.

One of the most important parts of the oil burner is the atomizer. It is made of bronze and is machined all over. The inside is machined as illustrated in Fig. 20. A mandrel, such as shown at *A*, is placed in the atomizer to assist in the chucking. The seat is turned to approximate size by the tool shown in the toolblock. Then the surface is hand scraped. The templet *B* is used to obtain the correct contour and to inspect the completed cut.

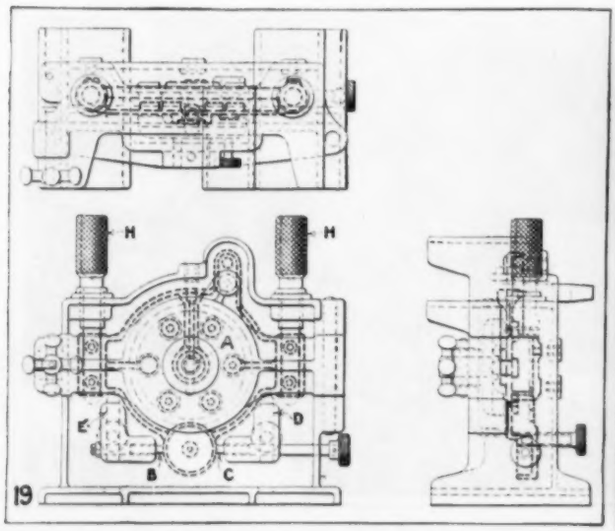


Fig. 19—Constructional details of turnover jig for the head base.

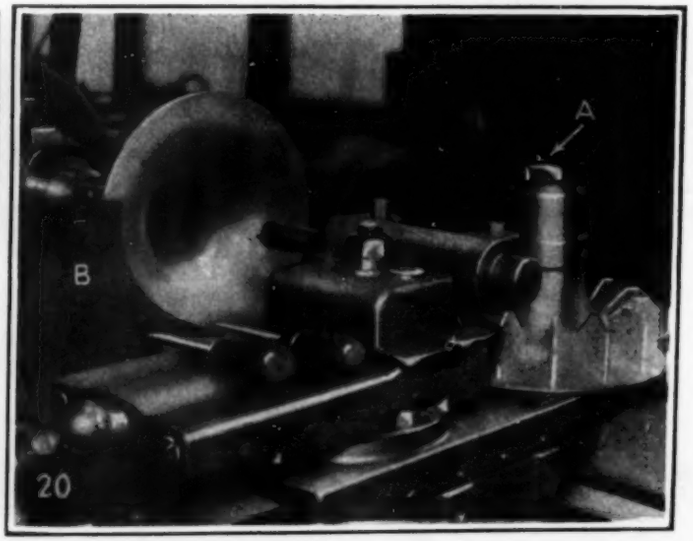
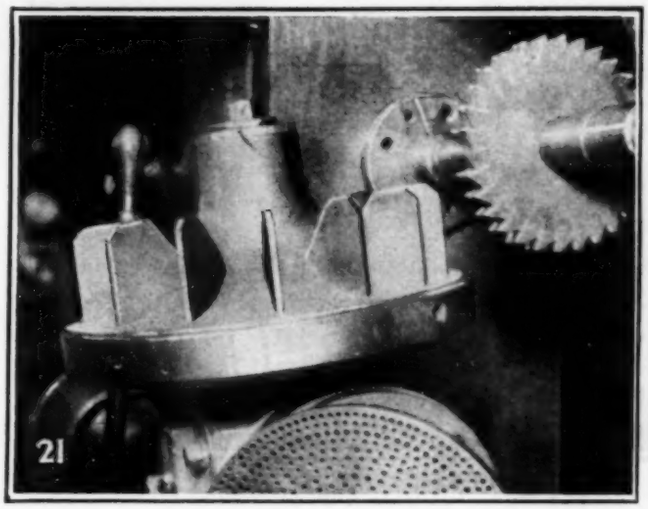


Fig. 20—Finishing inside radius of an atomizer



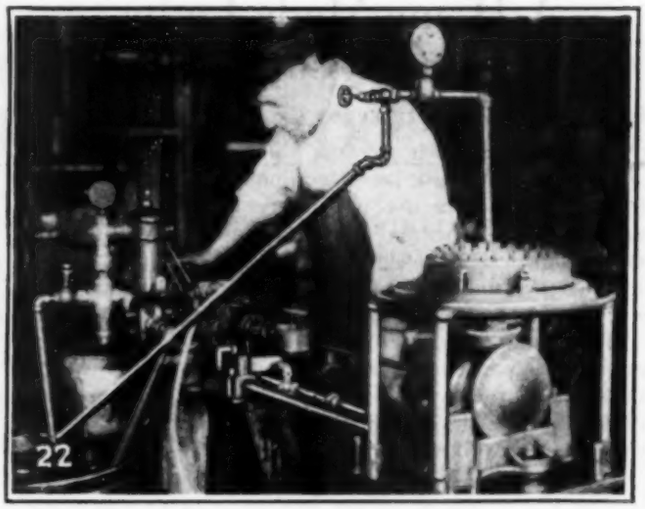


Fig. 21—Milling the vanes of an atomizer. Fig. 22—An oil burner set up for the final test

The surface is then polished with abrasive cloth.

Air vanes of the atomizer are milled as illustrated in Fig. 21. Straddle milling the sides of the vanes is done by mounting the work on a mandrel in the dividing head, and then feeding it to the cutters. The metal in the spaces between the vanes is machined by a solid cutter at the same set up. The atomizer then is chucked in a lathe where the curvature of the neck, adjacent to the section milled, is finished. The outside diameter of the vanes also is machined, after which the final operation, that of polishing and balancing is completed. On account of the high speed at which the atomizer rotates, it is essential to have it balanced as perfectly as is possible. The atomizer is an odd-shaped piece to machine and the operations require skill far more exacting than is necessary in the average run of machine work.

After assembly, the oil burners are tested for performance, chiefly for accuracy of the sub-units, ease of operation, quietness, and efficiency of the various controls. In Fig. 22 is shown a unit set up for the testing.

Modern Methods and Efficiency

By James McIntosh

THE question as to who is competent to decide the procedure as to sequence of operations, or the equipment to be used to produce a complex detail, is one that depends on circumstances and the ability available.

There are machinists who may feel that they understand a blueprint, but they do not understand it in the way that a patternmaker or a molder *must* to decide his problems. To pick out a few machine sizes and to analyze three or more views on a drawing and see a complex structure as it would appear in reality, is another problem, and one who does not have that ability is of little assistance to a tool designer where there is a new design.

If we consider the conditions in an auto factory, as to the usual class of help employed on special jobs and machines, it is safe to assume that the foreman is a graduate from that class, and is of little value in solving his own problems as to the methods, sequences, or tools used. The superintendent is usually an organizer of men but is seldom an authority on the fine points of tool design. I will cite an experience that resulted in a desire to O.K. all designs for jigs and fixtures. It happened that a few of the larger fixtures were drawn half-size and the superintendent signed the drawing as O.K. When the castings were delivered, the general metal was $1\frac{1}{8}$ in. thick, and out of proportion for the work to be done. Their rejection resulted in a rule that all drawings be made full size, so that he would not repeat the experience by being deceived, due to a half size drawing.

It is not unusual to find a chief engineer who puts his O.K. on a detail with little thought of the problems of others. Here we have the two extremes, design on one end and production on the other, with "puzzles" for the intermediary to solve, and high costs as a direct result of that system. With the above information as a basis, it will be seen that before any success is possible, the ability of someone who can see defects that tend to show production, is of value and he is more liable to get consideration than those who have not the skill to analyze a drawing.

A high-grade tool designer will study his problems and eliminate the "bugs" from a design before a pattern is made. He will also decide the amount of finish required for two reasons, first, he wants to know what to expect as to clearances necessary in a fixture, and second, he must decide the kind of tools required and the method used to control the piece so that it will not be distorted due to generated heat, as the result of removing an abnormal amount of metal removed by a single cut on several faces in the first operation.

How many who are good lathe hands can figure a train of gears to cut a simple thread? Ask the average man to cut $11\frac{1}{2}$ threads on a pipe flange and see him let go of the lead screw and take hold of it at the proper place. It is no disgrace, because it is not necessary where modern machinery is used.

He who decides production problems must have the ability to analyze the most complex of design *on paper*. He must see his problems before they develop in reality, and have the influence to eliminate "puzzles." He must be in a position to suggest practical solutions and see them carried out to a final conclusion in a finished product. A production engineer that has ability may make a success—when his ability is limited he is laying the foundation for disaster.

A Home-Made Lathe of Large Capacity

By Herbert Brown

SIXTY years ago it was not so simple a matter as it now is to purchase heavy equipment for the machine shop, and it was a not uncommon practice, especially for shops that operated foundries as a part of their regular business, to design and build on the premises all or many such items. The lathe shown in the illustrations herewith is an example.

The regular product of the shop in which this lathe was made is papermill machinery, no small part of which consists of large cylindrical rollers of cast iron. These rollers—called "dryers" in the technical parlance of the paper mill—revolve upon trunnions.

Every part of the lathe shown herewith except the flat-link chains that drive the feed movements was made in the shops of the Smith & Winchester Manufacturing Co. in South Windham, Conn., including the patterns for the castings and the castings themselves.

This lathe swings 60 in. over the carriages and will take a dryer 10 ft. in length between centers. The solid, forged spindle of the lathe runs in two-piece bronze bearings, which may be adjusted by means of shims between the two halves, which are held down by caps and screws. The headstock, Fig. 1, is provided with the usual tumbler gears to reverse the feeds, but the distance between the stud and the feed rod is so great that the usual train of gears has been replaced by a chain and sprockets. There is no leadscrew.

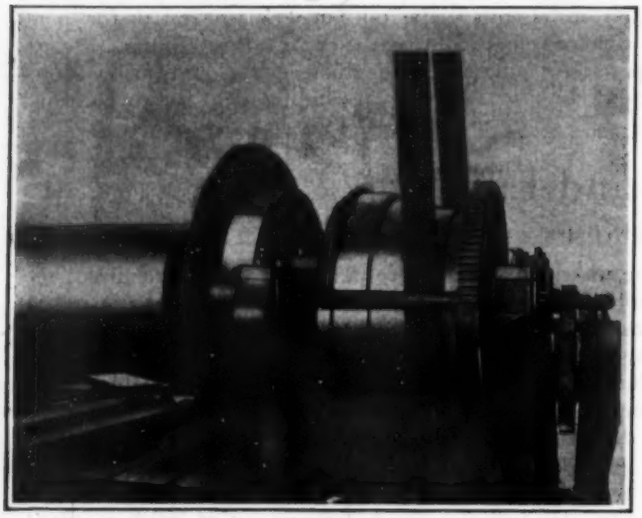


Fig. 1—Headstock of old lathe

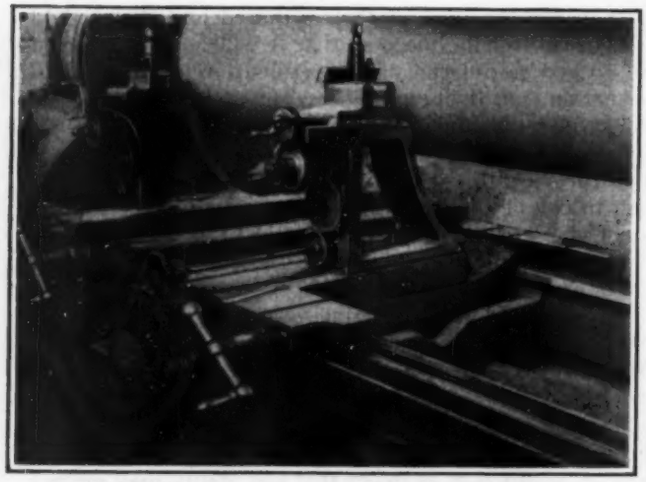


Fig. 2—Front view, showing carriages

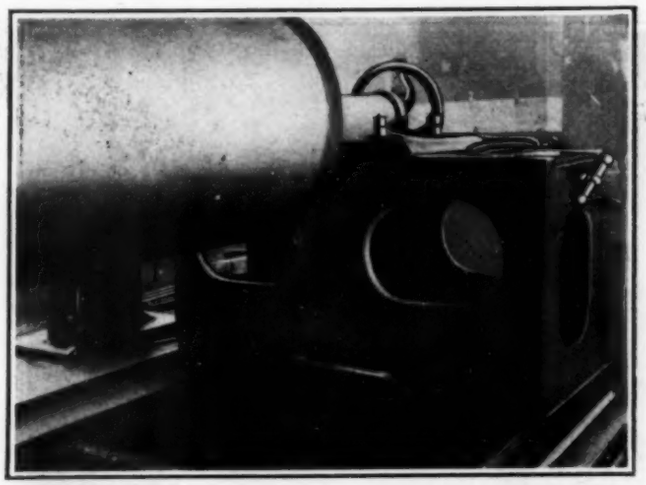


Fig. 3—Showing unusual width of bed

The faceplate is permanently fastened to the spindle nose and takes its drive through an annular gear bolted to the back instead of the usual gear keyed to the spindle. The backgears are keyed to a solid shaft that runs in bronze half-boxes slidably mounted in yokes and provided with transferable pins to hold the gears in or out of mesh.

As may be seen in Fig. 2, there are two carriages, each provided with a high bracket on the top of which is a cross-stick carrying a toolblock. Each bracket is located by a T-slot and is held by clamp bolts so that it can be adjusted transversely with reference to the center line to accommodate cylinders of different diameters. The comparatively small cross-slide on each bracket provides for plenty of motion of the toolblock, both for tool setting and for the small amount of squaring necessary on the ends of the cylinders.

Longitudinal feed in either direction is applied to both carriages through a splined feed-rod extending the full length of the bed. A worm and wormwheel, the latter provided with a friction clutch for disengagement, transmit the power through a train of gears to the pinion that meshes with the stationary rack of the bed. The stud of the wormwheel projects through the wall of the apron and is fitted with a sprocket to drive the cross-feed.

The first member of the train of gears that drives the cross-feed is splined to the transverse shaft so that the bracket may be adjusted without reference to it. One other member of this train slides upon its stud so that it may be moved out of mesh and thus disengage the cross-feed.

The view of the tailstock in Fig. 3 shows the unusual spread of the shears, the distance between the inner pair being 54 in., and between the outer shears upon which the carriages move, 63 in. The upper part of the tailstock is gibbed to the lower part so that the tail center may be offset for turning tapers. The screw and hand crank to adjust the amount of offset is an unusual feature. Though this lathe was built so long ago as to be beyond the memory of the oldest inhabitant, it is in constant service.

Abstracts of Convention Papers

The following are abstracts of some of the papers presented at the convention of the American Society for Steel Treating and the production meeting of the Society of Automotive engineers

Machinability of Metals

By ORLAN W. BOSTON

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THE "machinability" of metals is a term which has been given considerable prominence, but like the "hardness" of metals, it is not clearly defined, and may be expressed in several different ways, each independent of the other. Merely to state that the metal is machinable or non-machinable is no longer sufficient, as what may be considered machinable by one process may not be by another.

No completely adequate explanation of just what happens when metal is cut is available. Each chip seems to be removed by various proportions of tear, shear, and flow. Heat is generated by these actions as well as by the subsequent bending of the chip and the rubbing action on the tool. The measurement of the intensity of heat developed has been made by tool-work thermocouples, but the amount of heat generated by each action independently is as yet undetermined. The lack of such information retards the development of a comprehensive philosophy of metal cutting.

Most of the methods which have been used as means of indicating the machinabilitiy of metals, deal with the force on the tool or the power absorbed, the life of the tool, or the finish left by the tool. In the first, where the force or power is measured, the material being tested is the only variable, as even an inferior tool will retain its geometric shape and cutting edge throughout a large number of comparative tests. In the second, where the tool life is concerned, the variables of the tool material and treatment are to be reckoned with. This method, however, is more practical commercially, as it is a duplication of actual shop work and also because of the lack of interest of the manufacturer in the first method involving economy of power. The third method, which deals with the finished surface left by the tool, naturally confines itself to those cutting operations which are final.

Several of the methods which have been used to determine the relative machinability of metals are given in the following paragraphs:

1. The measurement of the force in the direction of the cut on a tool of given geometric form required to remove a chip of definite cross-sectional area and shape at a given speed.

2. The measurement of the power required for a standardized tool to remove a specific chip of various materials.

3. The ability of a standardized tool to cut various materials. This may be measured in terms of the life of the tool for a given cutting speed, or in terms of the cutting speed for a definite tool life.

4. A measurement of the finish left on the cut surface for various metals under standardized conditions.

5. The penetration of a standardized drill rotating at definite speed and under uniform load when cutting various metals.

6. The torque developed by a drill while drilling various metals under standardized conditions.

7. A cutting speed for certain tool life expressed in terms of tensile strength, reduction of area, or percentage of elongation of the various materials.

8. The hardness numbers of the materials as indicated by a hardness testing machine.

9. The measurement of heat generated and hardness induced by the cutting process.

In the above methods where various metals are being compared, the conditions should be so standardized that the material being tested is the only variable. (The author then discusses in detail a summary and comparison of the results obtained by various investigators on the influence of a number of factors on machinability. Formulas that have been deduced are given, and a number of charts are included.)

Because of the large field covered, it is impracticable to summarize and state the conclusions. It would be well if the various methods of testing machinability could be compared by direct data from the test bars so as to find if the torque or the feed in inches per 100 revolutions of the drill; or the force, power, tool endurance, Taylor-speed, in straight line cutting or turning, the energy absorbed by a milling cutter, etc., have anything in common.

Further, for determining the machinability of a metal under variable conditions, it appears that continued study of the properties of the metals at elevated temperatures as caused by the heat generated in cutting, the work-hardening by the tool of the material being cut, as well as further light on the subject of chip formation, will lead directly to a more thorough understanding of the principles underlying metal cutting.

Abstract of a paper presented at the Ninth Annual Convention of the A.S.S.T. at Detroit, Sept. 19 to 23.

Experiments on the Wear of Plug Gages

By H. J. FRENCH and H. K. HERSCHMAN
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PREVIOUS laboratory experiments were restricted to the gaging of file-hard high carbon steel, but the present series of tests of the wear of gages were made with test gages of high-chromium iron alloy, Stellite, and the ammonia treated chromium-aluminum steels marketed under the name of Nitralloy. The metals gaged were hardened high-carbon steel, an aluminum base piston alloy which had been heat-treated and aged, and cast iron.

Two gages were tested for each condition in each of the three metals. The tests were in general metal-to-metal wear tests in which non-metallic abrasives were absent. Each gage was inserted 4,000 times into the ring and the wear of the gage measured by decrease in diameter and by weight loss. The corresponding wear of the ring was determined by change in weight. This procedure was ordinarily repeated eight times so that comparisons of wear are based on 32,000 insertions of each of two gages making a total of 64,000 gagings.

The primary object of the tests was to develop information concerning the wearing properties of different metals for plug gages, and not to determine the effects on wear of initial condition of surface or methods of finishing plug gages. One of the important features shown was that gage wear was much more rapid when working in the cast iron than in the file-hard carbon steel or in the aluminum alloy, except in the case of two of the pairs of gages. These cases were that of the high-carbon high-chromium iron alloy gages, which were worn faster by the steel than by the cast iron, and that of the chromium-plated gages which were worn about the same amount when used in the cast iron as in the steel.

Wear was generally greater in gages used in the file-hard carbon steel than in gages used in the aluminum piston alloy, although this order was reversed in individual gages or in gages made from certain metals when the total wear per 32,000 holes was low.

When the wear of the gages is large, as in the cast-iron rings, then the wear of the rings is generally relatively small; when the wear of the gages is relatively small, as when gaging the aluminum alloy, then the wear of the rings is relatively large. However, there are many exceptions to this. For example, when working in the steel rings the gage loss of the file-hard ball race steel was about twice that of the file-soft ball race steel, yet the ring loss was about the same in both cases. The chromium-plated gages showed the highest resistance to wear in gaging each of the three metals, steel, aluminum alloy and cast iron.

The chromium-plated gages are outstanding in their resistance to the metal-to-metal wear encountered in the steel, the aluminum alloy and the cast iron. There was less than 0.00001 in. diameter decrease after gaging 32,000 holes in the aluminum piston alloy, with each of two gages.

Second in wear resistance is the Nitralloy; its superiority was most marked when gaging the aluminum alloy but it was better than any of the other metals except chromium plate when used in cast iron. It showed excellent performance in gaging the file-hard high carbon steel.

Both the chromium-plated and the Nitralloy gages have certain disadvantages. Some difficulties were encountered in obtaining an adherent electrodeposit of chromium which did not tend to crack or flake from the base metal. Likewise the nitride case of the ammonia-treated Nitralloy is exceedingly brittle as shown by the breaking off of small pieces in the threaded holes used for mounting the gages.

The file-soft oil-hardening tool steel gages are third in superiority of wear resistance; the remaining metals show variations in performance but no striking differences. For example, the Stellite gages showed good resistance to wear when used in the cast iron, but were unsatisfactory when used in the aluminum alloy.

Gage makers and users claim that file-soft steels do not make good gages because when these have a hardness well below that of an ordinary file they are easily marred, pick up material readily, and do not have a satisfactory "feel." While a highly scratched surface after test is consistent with these objections it should be noted that the file-soft gages showed less weight loss and smaller decreases in diameter than gages made from corresponding steels in the file-hard condition.

Abstract of a paper presented at the Ninth Annual Convention of the A.S.S.T. at Detroit, Sept. 19 to 23.

Aircraft Metallurgy

By HORACE C. KNERR
Consulting Metallurgist

THE term "aircraft" refers to the various structures by means of which man is able to fly. These are of two classes, namely, heavier-than-air, including airplanes, sea planes, flying boats, and lighter-than-air, including dirigibles both rigid and non-rigid, and other types of balloon. The metallurgical requirements of the aircraft industry are exceptionally exacting, and are a stimulus to the development of improved processes and materials. Other industries will benefit by such progress.

Among the materials adopted for aircraft use since the war are chromium-vanadium steel sheet, 3½ per cent nickel, chromium-molybdenum steel, duralumin, and heat-treated aluminum alloy sand castings of high strength. There has been some use of magnesium alloys. Stainless iron and some of the flame-resisting steels are beginning to find use and have great promise for the future, especially in sea planes.

Principally because of its superior cold bending properties in the annealed state, coupled with otherwise satisfactory characteristics, chromium-vanadium steel sheet

Abstract of a paper presented at the Ninth Annual Convention of the A.S.S.T. at Detroit, Sept. 19 to 23.

was adopted for the manufacture of fittings requiring high strength. This steel was not found to draw well into the lighter sizes of seamless tubing, therefore 3½ per cent nickel steel was employed. The latter is now giving way to chromium-molybdenum steel tubing, which not only draws well, but has exceptionally good welding qualities.

Duralumin first came into use in this country in the construction of the Shenandoah. Duralumin, and other wrought alloys of the duralumin type, in the form of sheet, strip, bar, drop forgings, seamless tube, rolled or extruded sections, rivets, etc., are finding a wide use in airplane and seaplane structural members, and also in such special locations as propellors, wing surfaces, pontoons and floats, hulls, fuel tanks, and the catapult launching cars used on shipboard.

Untreated aluminum alloy castings of the 8-per-cent copper type, in combination with aluminum sheet and tube, have largely replaced the heavier metals formerly used in fuel and oil lines, the joints being made by gas welding. Magnesium alloys, both cast and wrought, have been used to some extent, for example as forged propellors, as cast pistons, and as extruded structural shapes, but their tendency toward corrosion is still a drawback, although much improvement has recently been made in this respect.

The correct choice of materials in the design of aircraft depends upon a number of factors:

1. Strength and weight. These two properties cannot be considered separately, since it is necessary to produce a structure of the required strength without exceeding a certain maximum allowable weight, and desirable to come as much under this weight as possible in order to increase the useful load. The strength-weight efficiency of structural materials may be compared on the basis of a "strength-weight factor," obtained by dividing the ultimate strength in thousands of pounds per square inch, by the specific gravity.

2. Availability. There should be a dependable and adequate source of supply.

3. Suitability to fabrication. Labor and overhead costs should not be excessive.

4. Permanence. Freedom from serious deterioration with time, exposure, change of climate, etc., within the expected life of the machine, should be assured.

5. Initial cost. This is usually of secondary importance in comparison with the other factors, the cost of a finished airplane being around $10 per pound.

Effects of Quenching on High-Speed Steel

By B. H. De Long *and* F. R. Palmer

Metallurgists, Carpenter Steel Co.

CONSIDERATION is confined in this paper to one type of high-speed steel of the following analysis: Carbon 0.070, tungsten 18, chromium 3.50, and vanadium 1.10 per cent. In a steel of this analysis there are two temperatures which seem to be of vital importance for the quenching operation, one around 1,300 deg. F., and the second around 700 deg. F. As the steel is quenched past 1,300 deg. F. it becomes capable of hardening. As the steel cools through 700 deg. F., hardening commences, and proceeds gradually to completion. It is only after 700 deg. F. has been passed that the austenite is converted into martensite.

It should be realized that high-speed steel will harden just as effectively when cooled freely in air as when quenched in oil. This fact makes the quenching of high-speed steel much easier to observe than oil-hardening or water-hardening steels, since it is not necessary to have such accurate and elaborate apparatus for recording times and temperatures during quenching.

A curve was made illustrating the approximate Brinell hardness of high-speed steel during the process of air cooling. The piece was removed from the hardening furnace at 2,300 deg. F., and Brinell marks placed on it periodically during quenching. It was observed that the steel remained soft down to a temperature of 700 deg. F. This is approximately the hardness of annealed high-speed steel, and we get these low values because the steel has not yet begun to harden. As cooling progresses and the steel cools below 700 deg. F., the steel begins to harden at an increasing rate, attaining its maximum between 400 and 300 deg. F. By the time the sample has cooled to 250 deg. F., it is fully hard, and shows the same Brinell readings as when it finally becomes cold.

It is common practice to quench high-speed steel from the superheating furnace into molten lead or molten salts maintained at about 1,000 or 1,100 deg. F., and it is generally believed that if the steels are held in this quenching bath for perhaps one hour and then cooled to room temperature that they have been properly hardened and tempered.

Obviously, no steel can be tempered until it has first been hardened, and if we interrupt the quench between 1,300 deg. F. and 700 deg. F., we are holding the steel in its austenitic or unhardened condition, and consequently there can be no tempering effect.

High-speed steel when quenched into a molten bath requires tempering just the same as though it were quenched directly to room temperature without any interruption. It is most probable that lead-quenched and salt-quenched tools are not as highly strained as tools quenched continuously to room temperature, but from a metallographic, or structural standpoint, the net result is the same.

In hardening high-speed steel the importance of not quenching the tools stone cold has always been emphasized. There is nothing more likely to cause tools to crack than the practice of quenching them absolutely cold in oil, and then allowing them to lie around for some time before tempering. It is, however, a fact that high-speed steel must be quenched down to a certain temperature before tempering, or else the tool will be brittle and unreliable and likely to spall or chip in service. Many unexplained failures in high-speed tools can be traced to their removal from the quenching bath at too high a temperature, and then attempting to temper them before the steel has fully hardened.

Structures such as obtained in tests illustrating improper quenching have frequently been observed on high-speed tools which have cracked or chipped in service, and have been variously ascribed to poor steel, overheat in hardening, overheat in forging or rolling, or poor annealing. High-speed steel containing mixed structure

Abstract of a paper to be presented at the Ninth Annual Convention of the A.S.S.T. at Detroit, Sept. 19 to 23.

from partial dipping in the bath is more brittle than would have been the case had the tools never been tempered at all. If a tool is hardened and not tempered we have a certain degree of uniformity, but if the tool is only partially hardened when it is tempered, we get a mixed structure, which is brittle.

Since there is a spread of about 600 deg. F. between the temperature where high-speed steel first starts to harden (approximately 1,300 deg. F.) and the time when it actually hardens (approximately 700 deg. F.), there is ample opportunity within this range for the hardener to straighten or otherwise form high-speed tools during quenching. This is particularly valuable in the case of long reamers, taps, shear blades, and other tools. The steel may be safely and easily bent between these two temperatures during the quench.

Further, since high-speed steel tools are in no danger of cracking until they start to harden, and since the speed of cooling through the actual hardening range below 700 deg. F. is unimportant, there is really little reason for cracking high-speed tools. They can be quenched in oil down to approximately the flash point, and then removed from the oil and cooled in air, in which case there is not set up any more strains during hardening than if the tools had been air-quenched from the superheating furnace. This can also be done nicely by quenching into lead or molten salts, followed by cooling in either air or lime.

Development of High-Speed Steel Hack Saws

By HENRY B. ALLEN

Chief Metallurgist, Henry Disston and Sons Co.

IT IS true that high-speed steel is several times more costly than its predecessors, and its manufacture into tools is more costly, but the service resulting from its use is so vastly greater than that which could be had previously that its adoption has become almost universal for production work.

Plain carbon tool steel during the last century was used for hack saws as it was for other tools; the only distinction being that the carbon content was made very high, about 1.20 per cent or higher, or up to the point where the blade became too brittle. The reason why such a high-carbon steel made the best hack saw was made apparent upon the introduction of the microscope for the study of steel, at which time the effect of the nature and distribution of hard carbides became known.

Following the introduction of low-tungsten tool steels they were found to be admirably suited for hack saws, and were largely adopted. Here again the carbon content was often made high, taking advantage of the very hard carbide particles resulting therefrom. Today, except for the high-speed steel blades now being introduced, the large majority of hack saws are made of such steels.

Why is it that high-speed steel is only at this late day being commercially used for hack saw blades? The answer is that the very simplicity of the saw has until now made the application of high-speed steel to it commercially not possible. The consumer has considered the hack saw blade as merely a tool for which he pays a few cents, uses, or misuses, until dull and then throws away. This habit of mind has made commercial application of high-speed steel to hack saws impossible until the makers could produce them at a sufficiently low cost as well as make a tool that would cut better.

Tools more difficult to heat-treat could not be made of high-speed steel until better hardening equipment was devised. Such progress was made and soon more delicate tools such as milling cutters and twist drills were produced. The next advance covers the machine hack saw blade. This tool, which is commonly made in sizes of from 12 to 24 in. long, 1 to 1½ in. wide, 0.049 to 0.065 in. thick, and with from 6 to 14 teeth per in. along one edge, is not ground in any way before or after heat treatment. Its shape is such that in hardening as much consideration must be given to straightness as to proper hardness and toughness.

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The blades are made from blanks sheared from annealed hot-rolled high-speed steel sheet. A typical steel composition used is: Carbon 0.65 per cent, chromium 3.80 per cent, tungsten 18.50 per cent, and vanadium 1.00 per cent. Inasmuch as the cutting points of the saw are formed in the original surface of the sheet as it comes from the steel mill, the sheet must have a good surface. For the same reason even a trace of soft bark or skin cannot be tolerated. This entails the best mill and annealing practice.

The sheared blanks are clamped on a long milling machine bed and the teeth milled, after which the ends are trimmed to shape and holes punched. The blades next go to setting machines which bend the teeth over for about 0.008 to 0.010 in., thus giving the saw the necessary side clearance. The teeth are set over a little further than is desired in the finished saw, the reason being that the teeth tend to return to their original unbent position when heated to the high hardening heat.

The blades then go to be heat-treated. To insure uniformity the blades are hardened separately. By this method they come up to heat quickly, lessening the danger of overheating the teeth while waiting for the back to reach temperature. While the operation is not critically sensitive, the temperature must be under accurate control to within 25 deg. F., and the time at high heat to within 5 seconds.

For hardening, the blades are hung, through the hole in one end, on a spider made of heat-resisting alloy rod. From 6 to 12 blades constitute one batch, and are so mounted that each blade receives the heat at nearly the same rate. The preheating is done in a vertical cylindrical gas furnace using no muffle. A loaded spider is lowered into the furnace and held until thoroughly soaked out. A temperature of 1,700 to 1,750 deg. F. is used.

Uniformity of temperature in the work is important not only for the cutting teeth but also to prevent distortion of blades in quenching. After a preheated batch of blades is lowered into the high heat they require from 1 to 1½ minutes, depending upon thickness, for proper heating. A temperature of from 2,325 to 2,350 deg. F. is used. Despite the fact that some brands of full high-speed steel can be hardened at below 2,300 deg. F., so as to show after tempering a high hardness, experience has shown that better performing tools result when such steels are all put through the higher range of temperatures.

After soaking at high heat the charge is withdrawn and quenched in oil. The oil is kept at about 300 deg. F., and the blades are lowered vertically and slowly into it. If the oil is too cool, warpage occurs. If the blade is quenched out of vertical in the way that the tooth edge enters the oil ahead of the back, the blade will be warped so that the tooth edge is concave, and vice-versa. By quenching vertically the blade will come out straight.

As the saws are inspected after hardening, and straightened when needed, they are put under moderate pressure in a clamp. This allows them to cool evenly in a straight condition. When a furnace load of jigs are ready they are charged into an electric tempering furnace where they remain for a 30-minute soak at 1,050 deg. F. Tempering, even under considerable pressure, has little, if any, straightening effect on bent high-speed steel blades. With carbon or low-tungsten tool steels, on the other hand, the amount of straightening that can be done by tempering, even at 400 deg. F., under pressure is remarkable.

Much could be said about the mechanical features of the high-speed steel hack saw blade, as this phase of the subject is of great interest. The best tooth angles, clearances, spacing of teeth, hardness of the material being cut, and at what speeds and feeds; all of these points are equally as interesting as the manufacture. The author then gives figures to show the superior cutting performances of high-speed steel saws.

Integrated Production

By E. P. BLANCHARD
Advertising Manager and Assistant Sales Manager
Bullard Machine Tool Co.

THE labor-cost factor is becoming less and less significant. This diminishing of labor-cost began more than 150 years ago, when it was determined that a short cycle of operations by each workman, performed frequently, resulted in faster and cheaper production than letting one man worry through the complete process to the finished product. Motion studies and time studies have given us our present efficient workmen. But, in his evolution, machinery has gradually taken over more and more of the responsibility for performances to the point where the modern manufacturing process is preponderantly a machine process.

The time-study man knows that any piece of work can be broken down into the operations of which it is comprised, and that the machine time on each operation can be figured very accurately. He knows that with each tool cutting efficiently a definite length of time will be required to accomplish the job. With all the mechanical factors which determine maximum efficiency, such as form cutting tools and the speed and feed, held constant and unimpaired, the total accumulated time per tool for all operations on a given piece of work will be the same whether the work is done with only one tool cutting at a time or with 3 or 30 cutting. The production time for the piece will, of course, be shorter with more tools cutting, if the correct mechanical factors of tool efficiency are maintained in each case. Actual cutting time is shortened by the multiplication of tools in simultaneous operation. Let us coin a word and call this "simultation." It is a mathematical factor and holds true of machine performance in any process of manufacture; whatever the job may be, if it is broken down into the smallest possible work units, the accumulated time of performance for all work units will be the same, though there is a saving in total production-time by the combining of work units and by the "simultation" in performance.

One cutting tool traversing the length of a plain straight bar in turning will require three times as long as three tools for the same purpose working simultaneously; therefore, the "simultation" in this case is three. But if the bar is to have two different diameters and the feet per minute requires a different spindle-speed on each diameter, the bar becomes two separate work units which cannot be combined under the same conditions. They are not subject to "simultation" except by compromise in the factors. The same is true in milling operations. Two different milling-cutters may be mounted on the same arbor, but if the work requires two different diameters of milling cutters, which justifies a change in cutter revolution to maintain the proper cutting speed, here again are two separate work units. Work units may be multiplied indefinitely in this way and in all kinds of work, even in the production process itself, for the complete manufacturing method from raw material to finished stock is but a combination of work units.

In metal cutting, however, the work units or operations of which the finished job is composed must be combined in a way to comply with the nature of the work, and special attention must be paid to the limits of mechanical performance of machinery in any one unit. Further, in combining the units, an exact balance of work allotted to each must be maintained. To do this may require splitting certain of the longer operations or splitting some of the greater units and increasing the "simultation" in the job, so that with every factor of the machine performing to its highest efficiency, or every work unit being performed at the highest possible rate, they will "time" to a least common multiple. The process to the ultimate finished piece will be performed in the shortest possible time. This, in effect, is a refinement of integrated production.

In working toward greater profit per unit, it must be remembered that every stage in quantity production justifies its own limits in refinement of equipment and methods. In every job there is a point at which economy is greatest for the particular quantity required; any point of refinement beyond this peak of economy enters a period of diminishing returns. This is a proportionate figuring of carrying charges on the equipment necessary as against the operating cost for performance.

Referring again to the older principles of production, it can be observed how the breaking down of any job into its small work-units is similar to the principle of the division of labor, and how skill in the machine is required for each work unit to meet exactly the mechanical requirements of the operation and the conditions of highest efficiency.

Integrated production goes one step further. It combines the division of labor and the transfer of skill and intelligence in each work unit, properly balanced and

Abstract of a paper presented at the Production Meeting of the S.A.E. at Cleveland, Sept. 19 to 23.

performed simultaneously to comprise a complete process or method performed in the shortest possible time. Here is a scientific principle which is old and established in practice, but as a principle is modern and subject to more extensive application for the purpose of deriving that greater economy which is the present objective of production engineers.

As to that economy, which may seem to come in dribblets, if one takes the financial point of view of his own accomplishments, he will see the accumulated results of his effort. In the present automotive-manufacturing process, smaller quantities of materials are in inventory and in work in process, less money is tied up, and, in effect, a quicker turnover results than formerly. Aside from the savings in direct and indirect labor, consider for a moment what the more consistent performance of modern machinery has meant and what faster production has served. There is the reduction in the raw material inventory, a smaller amount of work in process at all times, and a greater flexibility in the process, which avoids overproduction. There is a quicker turnover from raw material to finished goods, with not only a shorter financing period but smaller amounts of money required and less tied up in forms which are subject to possible loss. Such savings, on a national scale, and in the volume which the automotive industry represents, cannot fail to contribute millions to the favorable financial situation that now exists.

Application of Electric Motors to Machine Tools

By R. C. DEALE
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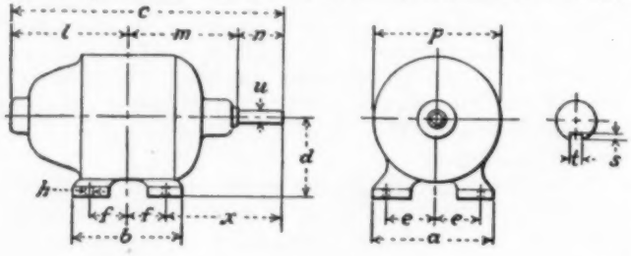
MANUFACTURERS and users of machine tools have been put to great trouble and expense because of the lack of uniformity in the mounting dimensions of the electric motors built by the different manufacturers. Not only does no uniformity exist, but there seems to be very little attempt at uniformity. This is very much in contrast with the situation in Germany, where the motors built by all manufacturers have the same mounting dimensions.

In Table I is shown the comparative dimensions of the 5-hp. squirrel-cage induction motors of 40 deg. C. continuous rating at 1,200 r.p.m. as built by 13 representative American manufacturers. In Table II is given the same information for direct-current motors.

Two large classes of motor mountings exist, and these require two degrees of standardization. The first comprises those machines in which some flexible type of drive, such as chain, belt, or texrope is used between the motor and the machine. In this class of drive the dimensions of the motor-shaft extension *u*, *n*, *t* and *s* are of most importance. Where shaft extensions are not the same, each motor drive must be sent through the shop separately, so that the pulley or sprocket can be machined to fit the motor being used. This naturally delays shipment, as it prevents the use of a standard piece of equipment. It also increases the cost of the machine and also requires an individual machine set-up when the bore is being machined.



Holding down bolts must also be treated separately, as no one size will do for all motors of the same rating. In the case of the motors shown in the tables, four different sizes of clearance bolts, or seven sizes of body-fit bolts, are needed. This seems to be entirely unnecessary, especially as most holding-down bolts seem to be considerably larger than is necessary to resist the torque of the motor. It seems very easy to come to some agreement on this point. The great spread in the mounting dimensions *a*, *b*, *e*, and *f* also makes it impossible to design a mounting platform that will suit all motors and yet look well. The extra operations required due to lack of uniformity can easily add a week to the delivery of the machine, and $25 to $50 to its total cost.

In the case of gear drives, the situation is much more serious. Here the shaft extension and holding down dimensions are just as important as in the previous case. In addition, the dimensions *d* and *x* must be considered to assure that the axis of the motor bears the proper relation to the axis of the motor pinion or driven gear. In a drive of this type, it is necessary to make an attachment drawing every time a different motor is used. The

Abstract of a paper presented at the Production Meeting of the S.A.E. at Cleveland, Sept. 19 to 23.

TABLE 1—COMPARISON OF ALTERNATING-CURRENT MOTOR DIMENSIONS

Make	Type	Frame	Shaft Extension, In.				*h*	*d*	*b*	2*f*	*a*	2*e*	*x*	*l*	*m*	*c*	*p*
			u	*n*	*t*	*s*											
Allis-Chalmers	AR	110-D	1 3/8	5	3/8	3/16	4 1/64	6 1/2	11 3/8	8 1/2	12 1/4	10					12 3/8
Louis Allis	HD	L 618	1 1/4	3 3/4	1/4	1/8	2 1/32	7 3/4	9 1/8	8 1/4	14 3/4	11 1/4	8 7/16	9 5/16	9 5/16	22	14 1/2
Century	S C	8 B	1 1/2	4 1/2	3/8	3/16	1 7/32	7	12 7/8	10 1/2	13	10 3/4	8 13/16	9 21/32	9 1/8	24 1/32	13 1/2
Crocker-Wheeler	Q	13	1 1/2	3 3/4	3/8	1/8	2 5/32	7 5/8	11 1/2	9 1/4	14 1/2	12	8 3/4	9 5/8	9 5/8	23	14 3/4
Electro-Dynamic	AK	131	1 3/8	3 1/2	3/8	1/8	1 31/32	8 3/8	8	6 1/4	16	13 1/2					16
Fairbanks-Morse	B	8 C	1 7/16	4 1/2	3/8	3/16	2 1/16	7 7/16	9 3/8	7 1/2	15 3/4	12 1/2	10 1/16	9 7/16	9 11/16	22 5/8	14 7/8
General Electric	KT	946	1 1/4	4	1/4	1/8	2 1/32	7	11 1/4	9 1/4	14	11 1/4	8 1/2	9 5/16	9 1/8	22 5/16	14
Lincoln	D	212	1 3/8	4 5/8	3/8	3/16	2 1/16	6 3/4	12 3/8	10 3/8	12 5/8	10 1/4	9	9 1/4	9 9/16	23 1/16	13
Reliance	AA	22	1 1/4	3 3/4	1/4	1/8	1 29/32	6 3/4	10	8	13	10 1/2	8 7/16	8 3/8	8 1/16	20 13/16	13 1/4
Robbins & Myers	L	630	1 1/4	3 3/4	1/4	1/8	1 29/32	7	7 1/8	6	12 1/2	10	10 5/8	9 7/16	9 5/8	22 13/16	13 1/4
Star	A	45	1 7/16	5	5/16	5/32	1 7/32	7 1/4	9 7/8	7 1/2	14 5/8	12 1/2					13 7/8
Wagner	RP	11T	1 3/8	4 11/32	3/8	3/16	2 1/32	7 3/8	12	9 1/4	15 1/2	15	8 15/32	8 3/4	8 3/4	21 27/32	13 7/8
Westinghouse	CS	254-C	1 1/4	3 7/16	5/16	1/8	2 1/32	6 1/4	14 3/4	12 3/4	13 1/2	10 1/2	6 11/16	9 3/8	9 3/8	22 1/16	11 15/16
N.E.M.A. Standard			1 1/4	3 3/4	1/4	1/8											

TABLE 2—COMPARISON OF DIRECT-CURRENT MOTOR DIMENSIONS

Make	Type	Frame	Shaft Extension, In.				k	d	b	a	f	e	x	l	m	c	p	Net Weight, Lb.
			u	s	t	n												
Allis-Chalmers	E	70	1 3/16	3/16	3/16	5	41/64	8 1/4	13 3/4	15	5 1/2	6 1/4	10 3/4	15 1/2	10 3/4	31 3/4	15	375
Louis Allis	NA	I.630	1 1/4	1/8	1/4	3 3/4	21/32	7 3/4	11	14	4 3/8	5 7/8	9 7/16	12 13/16	10 5/16	26 7/8	14 3/4	330
Century					No Di	rect-C	urrent	Motor										
Crocker-Wheeler	F	I	1 1/4	1/8	1/4	3 7/8	25/32	8 1/4	13 1/2	13 1/4	5 3/8	6 9/16	8 11/16	11 13/16	10 7/16	26 1/2	15 1/4	330
Electro-Dynamic	SC	1	1 3/8	3/16	3/8	4 11/16	1 1/16	8 7/16	11 3/8	13 1/2	4 13/16	5 1/8	8 9/16	11 1/8	13 3/8	24 1/2	16 1/4	365
Fairbanks-Morse	DH	70	1 1/4	1/8	1/4	3 3/4	21/32	9 1/8	11 1/2	18	4 1/2	7 1/8	8 1/4	12 11/16	9	26 9/16	17 3/4	355
General Electric	CD	65	1 1/4	1/8	1/4	3 3/4	21/32	8	11 3/4	15 1/8	4 3/8	6 5/16	8	13 3/8	8 3/4	26	15 7/8	350
Lincoln					No Di	rect-C	urrent	Motor										
Reliance	T	23	1 1/2	1/8	3/8	4 15/16	25/32	8 1/4	14	15	5 3/8	6 9/16	9 3/8	14 1/8	10 5/16	29 3/8	15 3/4	350
Robbins & Myers																		
Star	SB	5	1 7/16	5/32	5/16	5	21/32	7 13/16	10 7/8	15 3/4	4 7/16	6 3/8	9 1/8	11 1/8	8 1/2	24 3/8	15 1/4	396
Wagner					No Di	rect-C	urrent	Motor										
Westinghouse	SK	33	1 1/8	1/8	3/8	4 1/2	25/32	8 1/4	13 1/2	16 1/2	5 3/8	6 9/16	9 3/8	14 15/16	10 3/4	30 3/16	15 3/8	346
N.E.M.A. Standard	....	...	1 1/4	1/8	1/4	3 3/4	.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

variation in the dimension x, which some people do not seem to consider seriously, is sometimes enough to require a new base plate pattern, when the center height is so close to an older pattern that, otherwise, it could be modified slightly. Motor manufacturers claim that standardization of dimensions would interfere with their freedom of design, but it is difficult to see any great advantage in slight alterations of shaft diameters or of holding-down bolts.

The difficulties encountered by the machine manufacturer due to lack of interchangeability of motors are passed on to a customer in the form of lengthened shipping dates and increased costs. In addition to this, in any plant where there is a constant flow of production, it is not possible to allow a machine to stand idle while repairs are being made to the driving motor. Consequently, it is a practice to remove the motor which has given trouble and to replace it by a spare. With the great variations in mounting dimensions it is difficult to do this. It is impossible to replace the motor of one make by one made by a different manufacturer without considerable contriving. Moreover, the frequent changes in dimensions made by individual manufacturers make it difficult to replace a motor by one built only a short time later.

External Honing of Crankshaft Bearings

By L. A. BECKER
Chief Engineer, A. P. Schraner & Co.

THAT a surface which has been ground is unfit as a bearing is well known, for every manufacturer and every user of crankshafts has endeavored to improve the surface by some method. While these methods have varied to some extent, they have been inherently the same, and their results have been similar. Hand polishing the bearings one by one with emery cloth and crocus cloth, as the shaft is revolved rapidly in a lathe, undoubtedly removes some of the sharpness left by the grinding wheel, but it is slow and unsatisfactory. The human element and the labor cost are high, and the results, depending on the time spent and the spirit of the workman, are often disappointing, since the work is disagreeable and likely to be slighted.

The surface left by the grinding-wheel is shown under a high-powered glass to be composed of sharp ridges and valleys. A cross-section presents a decidedly saw-toothed appearance. However, should a carefully ground crankshaft be assembled in an engine with sufficient bearing clearance and be very carefully run-in, as it surely needs to be, it will in time develop excellent bearing surfaces throughout. The grinding marks will disappear and the surface will become smooth. But when this condition is reached, the bearing clearance will be excessive, due to wear on the shaft and in the bearings in which it turns, added to the abnormal clearance required by the original surface.

The honed crankshaft presents bearing surfaces equal or superior to those of a hand-polished shaft that has been carefully run-in for 1,000 miles or more. Honing has taken the initial wear from the bearings before the shaft is placed in the engine. This removal of the initial wear and correction of grinding errors is the essential object of honing.

The process of honing evens the ground surface by leveling off the ridges left by the wheel, and if continued long enough, will result in a very smooth, hard and brilliant surface at a level slightly below the bottom of the grinding marks. Lapping, as distinguished from honing, will likewise remove grinding marks, but the final results are not such as are desired.

Honing may be termed a modern method of lapping, using bonded abrasive blocks instead of a metal block charged with abrasive. The stones are arranged in holders and are dressed to the required contour with a diamond. The hone, which is an assembly of one or more stones in the holder, is held against the work as the latter revolves and reciprocates. During the operation, the work and the hone are flushed continuously, usually with kerosene. This facilitates the honing by keeping the stones sharp and the work clean, and does much to prevent the stones from becoming glazed. Honing is a faster operation than lapping, as it removes more material in a given time. It also corrects to a greater degree, and the quality of the finish is superior to that obtained by lapping.

Because of the slowness of hand-polishing crankshafts and the inferior finish obtained by that method, the company with which I am connected saw the possibility of developing a machine for this operation. Lapping was first considered and extensive trials and experiments were made, but the results were disappointing. Honing was then tried, and though the proper stone was not procurable, the experiments gave encouragement that suit-

Abstract of a paper presented at the Production Meeting of the S.A.E., at Cleveland, Sept. 19 to 23.

able stones could be developed. The design of a honing machine was then started and all the elements necessary for this method of crankshaft finishing, such as automatic timing-device, adjustable reciprocating platen and kerosene wash, were incorporated.

The acting of the hone is shown by placing a crankshaft in a crankshaft honing-machine, revolving it for only a few seconds, and then inspecting the bearings. Chatter marks that were impossible to detect on the ground surfaces become very noticeable. Also misalignment, taper, or out-of-roundness, if existing anywhere, are made very apparent, since only the high spots have had contact with the hone. If the operation is continued long enough, these high spots will receive a brilliant finish, and this brilliancy will be seen to taper off toward the low spots until it disappears entirely. Where the grinding marks have been only partly honed away, the tops of the ridges show a leveling-off and a polish, while the bottoms of the marks have not yet been reached.

To appreciate the action of the hone and the importance of the correct grain, grade and bond of stone, the difference between the action of a grinding-wheel and a honing stone should be considered. The wheel is revolved to distribute the work among all the cutting points. Any given cutting point on the face of the wheel is in contact only momentarily with the work being ground. It enters the work and leaves it as the work revolves, removing a chip much the same as does the tooth of a milling-cutter. The honing stone, like the grinding-wheel, has a great number of cutting points but, since only the work revolves, any given cutting point is in constant contact with the work, depending upon the condition and contour of the surface, much as is the case with a turning-tool. As the work is reciprocated while it revolves, the cutting points have a shearing action over the ridges left by grinding.

The action of a grinding-wheel on a given kind of work depends almost entirely upon the grain-depth of cut. The bond must wear away at the same rate as the abrasive grains wear down, to make the wheel work well. Likewise, the bond of the honing stone must wear away at the proper rate, but in honing there is no grain-depth of cut in the sense applied to grinding.

As stated before, the purpose of honing is to remove the initial wear left in an ordinary bearing-surface and to give the bearing a perfect form. By properly controlling the elements this can be accomplished with uniformity, and since all main and connecting-rod bearings are honed at once, the operation is done at a great saving of time over the old method. Thus we have the old story of a machine doing work better and faster than it can be done by hand.

Locomotive Forging Steels

By O. V. GREENE

EXPERIMENTS have been conducted with various types of heat-treated alloy steels for connecting rods, crank pins, piston rods and other reciprocating parts of locomotives. The tensile properties obtained with S.A.E. steels were quite good. The results of practically every service test with such material, however, were unsatisfactory. The reasons for this were numerous. The alloy steel ingots were as a rule not large enough to have billets of the required amount of reduction manufactured from them. Also the forgings were so large that it was nearly impossible to obtain uniform physical properties throughout the section after heat-treatment. Of course these same steels are excellent for heat-treated automobile forgings, as the sections are small enough for the heat-treatment. If the mass and section of a connecting rod be compared to an automobile crankshaft, the difficulties encountered in the heat-treatment will be obvious. Finally, although it has not been definitely proven, there have been a sufficient number of cases to warrant the belief that if the surface finish on steels of this type is not the best obtainable, the fatigue strength is greatly lowered as compared to ordinary carbon steel with the same finish. There have also been sufficient cases that lead to the belief that the presence of cracks and nicks caused by accidental blows, grooves caused by wear, and shoulders with short radius fillets have a more marked effect on the lowering of the fatigue strength of such alloy steels when applied to locomotive forgings, than on carbon steel.

But while quenched and tempered carbon steel has the tensile properties required by the specification, such forgings fall considerably short of being an ideal material. Because of the large mass of metal in most of these forgings, high internal strains are set up on quenching. Consequently, a forging is applied to a locomotive in an internally stressed condition.

Because of the difficulties encountered with the complex alloy steel and with quenched and tempered carbon steel, the trend in recent years has been to use for railroad forgings a simple alloy or carbon steel in a double annealed or normalized condition. The most important of the simple alloy steels used are manganese and vanadium. Each of these steels has advantages peculiar to it alone.

The vanadium steel is generally within the following chemical limits:

Carbon, 0.45 to 0.55 per cent; manganse, 0.70 to 0.90; sulphur, 0.040 max.; phosphorus, 0.040 max.; silicon, 0.15 to 0.25; vanadium, 0.19 min.; chromium, 0.20 max.

This steel is normalized at 1,600 to 1,650 deg. F., and the forging removed from the furnace and cooled in still air. This is followed by reheating at 1,150 to 1,250 deg. F., being removed from the furnace and allowed to cool as before. After this double treatment the steel showed a maximum elastic limit of 72,000 lb. per sq.in., and an ultimate strength of 113,000 lb. per sq.in. (The physical properties of other alloy steels that have been tested are also given by the author, as well as those of normalized carbon steels.) Of the simple alloy steels used for normalizing, the vanadium steel is slightly better than the manganese steel. This statement is of course based on the author's investigation only.

While the normalized carbon-steel forgings do not show physical properties equal to the vanadium and manganese steels, their use is justified since they may be economically applied to all classes of engines if the sections are large enough to insure the necessary factor of safety. On an engine where weight is important, such steels as vanadium or manganese are employed in order that the sections may be reduced in size.

Abstract of a paper presented at the Ninth Annual Convention of the A.S.S.T. at Detroit, Sept. 19 to 23.

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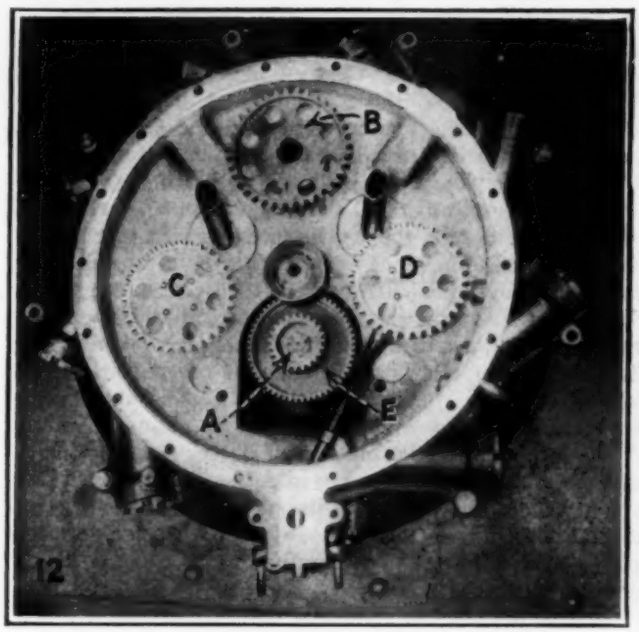

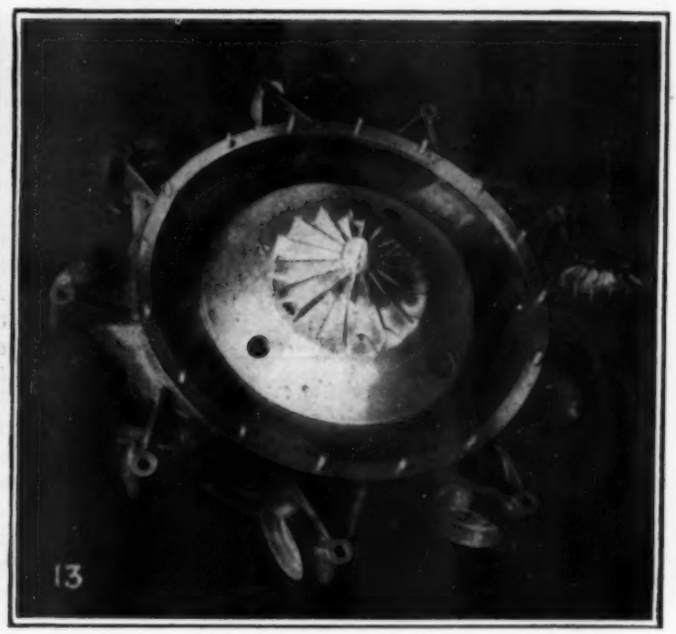

Fig. 12—In the blower section of the Wasp engine there are two circular chambers, divided by a partition. In the front chamber are to be found the various gears by which power is transmitted from the crankshaft to the auxiliary machinery in the rear-end section. Fig. 13—The impeller is driven through a step-up train of gears that cause it to revolve at a speed five times that of the crankshaft. Its duty is to drive the explosive mixture outward through conduits to the cylinders

The Air-Cooled Radial "Wasp"

By Ellsworth Sheldon
New England Editor, American Machinist

The "blower" section houses several vital parts and must be accurately machined

FITTING snugly to the main section of the crankcase of the Wasp engine, the "blower" is the third of the four sections of which the crankcase is composed. Roughly of the same diameter as that of the main section, it is about 6 in. long, with a web, or partition wall, dividing it midway of its length into two separate chambers. Rabbeted flanges forming oil-tight joints, connect it with the main section on one side and with the rear-end section on the other.

The chamber toward the front, which may be seen in Fig. 12, encloses the gears through which the auxiliary machinery on the rear section is driven. The crankshaft of the engine extends through the rear wall of the main section, in which the rear main bearing is seated, and terminates inside this chamber in a double spur gear, one diameter of which meshes with the pinion *A* and the other with the three larger gears *B*, *C* and *D*, which are spaced equidistantly from the center of the shaft.

Through gear B the mechanical starter, with which the engine is ordinarily equipped, applies power to turn over the crankshaft to start the engine. Gears *C* and *D* transmit power through their respective shafts to drive the magnetos, the circulating pump that delivers oil under pressure to all revolving bearings, and the fuel pump that conveys gasoline from the tanks to the carburetor.

Directly in line with, but not directly connected to, the crankshaft is a short shaft extending through the partition wall of the blower section and terminating in the impeller of the supercharger—the part that gives to this

The third article. The fourth will appear in an early issue.

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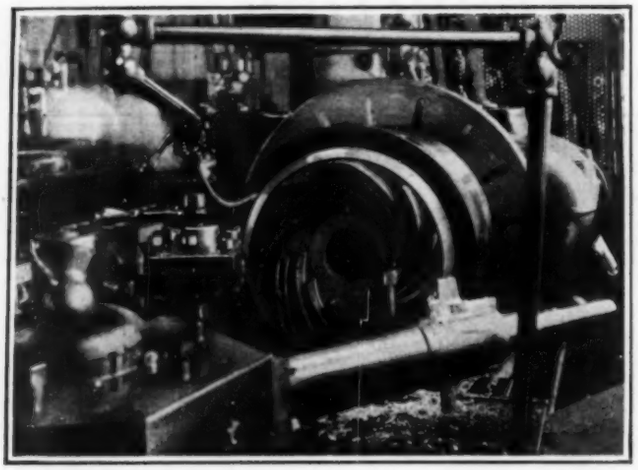

Fig. 14—The front wall of the rear-end section closes the rear chamber of the blower section. The fixed curved ribs to be seen in this illustration form volute passages to conduct the gases from the whirling vanes of the impeller to the openings in the peripheral wall of the section

section its name of "blower." This shaft is driven through the step-up train of which pinion *A* is the first driven member and the gear *E* behind it the second driver, the first driver being keyed to the end of the crankshaft. Gear *E* meshes with a pinion that is hidden behind the ball bearing to be seen at the center of the section, turning the short shaft in the same direction as that of the crankshaft at a ratio of 5 to 1 of the latter shaft.

Leading outward tangentially through the peripheral wall of the blower section are nine openings, to each of which in the assembled engine is attached a curved pipe, or conduit, leading to the combustion chamber in the head of its respective cylinder, to conduct thereto the explosive mixture of gas and air from the carburetor, forcibly ejected from the central chamber of the section by the impeller.

The impeller itself, which occupies the central portion of the rear chamber where it may be seen in Fig. 13, combines the functions of a propeller and a fan, scooping up with the curved edges of its vanes the explosive mixture drawn in through the central bore of the rear section and throwing it outward radially to the conduits in the peripheral wall of the section. At the normal engine speed of 1,900 r.p.m., the impeller turns at 9,500 r.p.m. and thus imparts to the mixture a considerable velocity and pressure.

The rear chamber of the blower section is thus the intake manifold of the engine. When closed by attaching the rear-end section of the crankcase to its flange, the space surrounding the impeller is occupied by the fixed, curved vanes to be seen on the front wall of the rear-end section in Fig. 14, which form volute passages leading from the impeller to the tangential openings in the peripheral wall of the blower. The opening through the center of the rear section, also to be seen in this illustration, is the passage through which the mixture is drawn from the carburetor.

Lathe work or its equivalent upon the blower section consists of facing the flanges on both sides; turning the projecting rabbet on one side to fit the main section and recessing the flange on the other to receive the rabbet of the rear-end section; boring and counterboring for the ball bearings of the impeller shaft; facing the large boss at the center of the rear chamber (as may be seen in Fig. 15) and at the same facing the angle of this boss to bear against the correspondingly faced edges of the curved vanes of the rear-end section; and various minor operations. Fixtures to hold the work on the table of a Bullard vertical turret lathe or the faceplate of a Lodge & Shipley turret lathe are provided.

These fixtures, made with flanges to match the corresponding sides of the work-pieces, are centered upon their respective machines by a dial indicator, and the rabbeted flanges, in turn, center the work-pieces upon the fixtures. On the jigs and fixtures to locate the many small drilled holes in the part, advantage is taken of the flange to center the work-piece. One of the early drilling operations is to drill the small holes in the flanges for the bolts that are to hold the sections together. Another is to drill the nine small bosses—one of which may be seen at *A* in Figs. 16 and 17—for the bolts that are to secure the engine to its supporting frame in the airplane. Both of these sets of holes become locating points to determine the circumferential setting in subsequent operations.

Several openings of different sizes are drilled, reamed, bored and counterbored in the partition wall of the section, some of them to seat bearings for the shafts through which power is transmitted to, or derived from, the auxiliary machinery of the rear-end section, while others are to seat the short breather pipes to be seen in Fig. 12, that communicate with and vent an otherwise closed, cored pocket in the wall. The fixture for this operation may be seen in Fig. 16, secured to the floor plate of the radial drilling machine in which the work is done.

The base of the fixture locates the section centrally

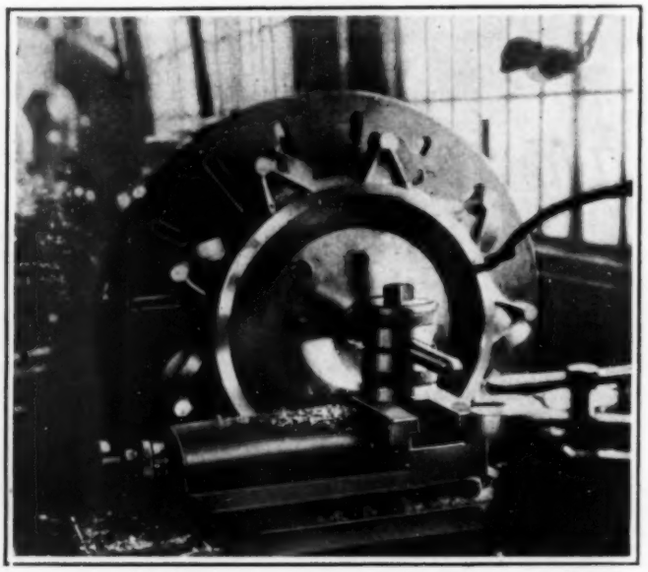

Fig. 15—Lathe work on the blower section consists mainly of facing the large central boss to conform to the correspondingly faced edges of the ribs in the rear-end section. The work upon the flanges was done in vertical turret lathes in an earlier operation

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by its rabbeted flange, and circumferentially by means of plugs, one of which may be seen at *B*, passing through the attaching-bolt holes in the section to bushed holes in the base of the fixture. The cover of the fixture is located by similar plugs, as at *C*, entering the bolt holes of the flange. Diametrically opposite bolts, as at *D*, secure the parts of the fixture together, clamping the section between them.

The radial drilling machine enables the operator to complete all of these holes at one setting, the various drills, reamers, counterbores and other tools being held in the machine by slip collets. Adjustable stops on the several tools, as may be seen in the illustration, regulate the depth of the counterboring and facing cuts.

The operation shown in Fig. 17 is core-drilling, counterboring, facing and tapping the tangential bosses to receive the conduits through which the explosive mixture of gas and air drawn from the carburetor and thrown off by the whirling vanes of the supercharger, is conveyed to the cylinders. The fixture employed is a nine-position indexing plate mounted upon the upright face of an angle plate base. The complete fixture without the work may be seen in Fig. 16, at the right.

The central stud of the fixture, at *E* in Fig. 16, assists the operator to put the work in place, but is not depended upon to locate it centrally. The shoulder at *H* fits snugly into the recessed flange of the section to accomplish this purpose. Studs *J* pass through the holes in the ears of the tangential bosses to locate the part circumferentially with reference to the locking bolt of the fixture. An L-head clamping bolt, to be seen at *K* in Figs. 16 and 17, binds the work and the rotatable member of the fixture to the stationary base while the tools are at work, and thus relieves the locking bolt of at least a part of the thrust of the tools.

The bushing bracket *M*, Fig. 17, is pivoted to the base of the fixture so that it may be swung out of the way of the bosses while the work is being indexed. When returned to working position it is automatically located and secured by a latch. The boring, counterboring and facing tools are each provided with a separate slip-bushing, one of which may be seen in place on the shank of the tool above the guide bushing. These slip-bushings remain on the shanks of their respective tools so that they are changed when, and by the same movement, that the tools themselves are changed in the slip-collet of the machine spindle.

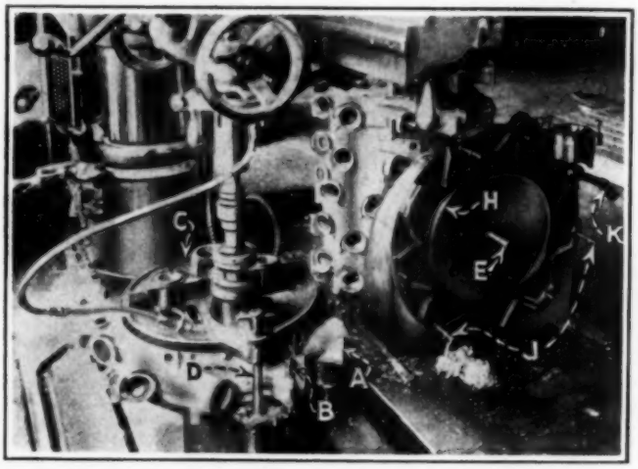


Fig. 16—Holes in the partition wall are drilled, reamed, bored and counterbored to seat bearings for the several shafts that pass through the wall of the section. The fixture to be seen at the right, is the one employed in the next succeeding operation

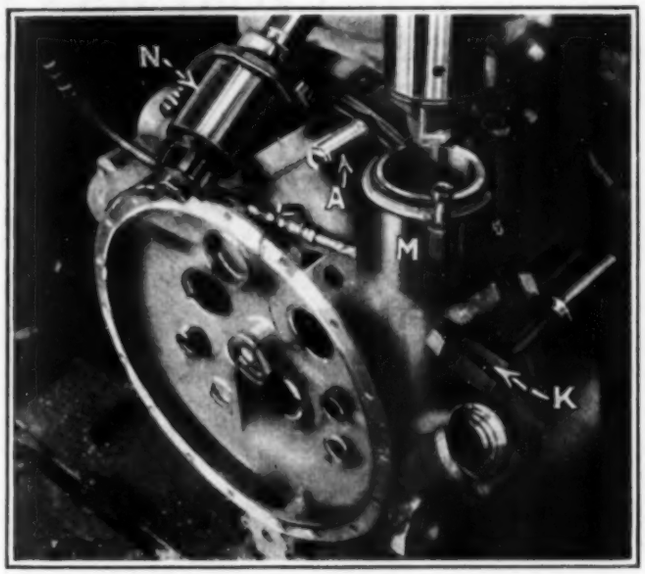


Fig. 17—The tangential openings in the peripheral wall of the blower section are core-drilled, counterbored and tapped to receive and secure the inner ends of the conduits by which the gases are conveyed from the central chamber to the cylinders

The tap and its bushing may be seen lying on the work-piece at *N*. The shank of the tap is threaded to the bushing—the thread being of the same lead as that of the top—and the threaded bushing when entered in the guide bushing is clamped thereto by the studs and nuts to be seen on the bracket. The tap is thus guided positively when starting the thread, and there can be no possibility of failure to start it properly.

A Serial Number with a Meaning
Discussion

By Chester E. Josselyn

IN W. J. Outcalt's criticism of Arthur A. Merry's method of machine numbering, on page 1082, Vol. 66, of the American Machinist, his objections can easily be overcome by the use of a couple of dashes. He says the thirty-eighth machine manufactured in Jan., 1922, would have the same number as the eighth machine manufactured in December, 1923 thus, 12238. If a dash follows the month and year, it will change the meaning and retain the good features Mr. Merry mentioned on page 563. The numbers 1-22-38 and 12-23-8, will represent the first and second cases, respectively.

Those who like to figure the "cost per pound" may be interested to know that while some automobiles still sell for a dollar a pound, some of the coach body cars range as low as 35 cents.

THE · FOREMAN'S · ROUND · TABLE

Learning the Value of Deferred Judgment

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

"I BELIEVE Williams made a mistake, Al. He's generally right, but it's my opinion that he should have fired Jackson then and there."

"Ed, it's not good policy for two foremen to talk over a third, though I think we're justified in talking about our super if we want to, with reservations, of course. But I'll talk this once about Jackson, because I have an idea that you don't know the whole story—and if you don't, it'll be easy to make my point."

"Go ahead, Al. I think I see an indication of a dusky form in the woodpile, but I'm willing to learn."

"The story isn't long, Ed. Williams fired Jackson once, and thereby learned the lesson of deferred judgment. Without going into the details—they were deceiving enough—Jackson was right. So Williams took him back. Now he doesn't fire until he knows he's right. Perhaps you've noticed how long it takes a foreman to get severed from this plant."

"Yes, I have. But tell me a little more about the first Jackson case. And what has it to do with this one? Anybody would back up Williams if he fired Jackson now."

"Well, the first case looked just as bad as this one. Jackson has the misfortune of getting into situations where things don't show up in his favor. Also, he's poor at passing the buck and offering alibis. My own opinion is that it never occurs to him to do either. I think Williams feels the same way. Right now it looks dark for Jackson. The work is not to the drawing, and the drawing is right. But that job was done some months ago, and you may bet that Williams is going to give Jack a mighty good chance to explain. For my part I don't want to see him go. He's a good man, in spite of getting into tight corners once in a while."

"While you've been talking, Al, I've been tying your story up with your first statement about how easy it would be to make your point. Guess you feel that I should have deferred my judgment. Well, I don't seem to be able to do that, because I can't see any way out for Jackson, but I do see that if there should be a way out, and I were in Williams' shoes, it would look pretty good for me if I delayed execution of my judgment. I've learned something from this case no matter which way it turns out, so I guess I'll wait next time."

Should firing be done on circumstantial evidence alone? With all due respect to the necessity for a leader to be able to make decisions promptly, isn't there much to be said in favor of deferred judgment where human relations are concerned? In the case in point, shouldn't an impartial committee, or individual, say the employment manager, determine the facts and report them to Williams for action?

All foremen are urged to discuss these questions. Acceptable letters will be paid for. The discussion is not limited to foremen, of course

Discussion of Earlier Topics

Looking Beyond the Department

IT IS not uncommon for foremen to become so absorbed in their own department that they forget they are only one unit working in conjunction with others for the interests of the firm. The big boss was fully aware of this failing when he tackled Ed. It is not sufficient for a foreman to keep the wheels of his department running smoothly, fulfilling all the obligations required of him, and then rest content. There must be a closer co-operation with other departments and a desire not only to make his own little section a success, but to help on in every possible way the interests of the firm. Unless the foremen have this interest what likelihood is there of the men caring a rap for the firm? In one local works a weekly meeting of foremen is called by the works manager, who reviews the work in progress and discusses any problems that may arise. These meetings have good results. The foremen realize that other departments exist besides their own. The machine shop foreman on finding that the machining allowance on a certain casting can be reduced informs the pattern shop foreman. If the erecting shop foreman sees his fitters scraping the bore of flywheels he notifies the machine shop foreman who checks up on his tolerance. Working on the same lines the draftsman will consult the machining department before altering a design, and receive suggestions that will ease the machining. In this work the finished product is something more than a mass of shining metal, both foremen and men feeling that they have contributed something towards its perfection.

—R. G. HEWITT, *England*.

THE · NEXT · TOPIC

What Is the Foreman's Job?

How many foremen have a thoroughly clear idea of their jobs, their scope and their limitations?

Of what use will job analysis be to a company?

Receiving Personal Mail in the Shop

THE receipt of personal mail in the shop is a nuisance that must be discouraged, but one which cannot be entirely wiped out. Off hand, it would seem that the more directly it was handled, by messenger to the shop man addressed, for instance, the less interruption it would occasion. Yet, this is akin to service, and the better the service is, the more likely it is to be utilized.

The best solution is to deliver it directly to the foreman of the man addressed. The foreman is sure to notice any abuse of the privilege, and even if he doesn't say anything, the employee is bound to feel sheepish about having the foreman act as his messenger boy. If the employee proves to be too thick skinned, the foreman can call him, and point out the fact that the continued receipt of a large volume of mail at the shop cannot be tolerated. If the employee has a legitimate excuse, he can justify himself. If not, he can be told that if the practice continues in unabated volume, his mail will be readdressed to his home. If any one class of mail must be received at the shop for personal reasons, it can be enclosed in an inside envelope addressed to the workman.

—FRED J. SCHIMPF.

Tool Sales in the Shop

IF YOU needed a new "mike," Al, when would you take the time to shop around for it? Would you leave your lunch and run around in the noon hour, or hunt around after 5 o'clock and be late for supper, or perhaps put in a Saturday afternoon? The hardware dealer out in my home town doesn't carry much of a stock of "mikes" or calipers. How much easier it would be to ask the purchasing department to order "One mike, Catalog No. so-and-so." (Of course you've got a small tools catalog. Most up-to-date foremen have.) If it takes the clerk a dollar's worth of time to put that order through, then there is something sour in the purchasing department. Most of the time they'll be glad to oblige—lots of firms figure that it pays to do a small favor for the men now and then—makes a man feel he's not working for an inaminate corporation but for some human beings. Asking the company to buy "mikes" in quantity is something else again. The tool manufacturers are up and doing nowadays. Styles in "mikes" and scales may change; the firm might be stuck with a bushel of mikes that the boys wouldn't buy, and that would be the last time the firm would ever try to help anybody in buying tools. Do anything in reason to accommodate your men in getting good tools, Al—you know very well that more good tools on the bench mean more good product on the shipping platform.

—CHARLES S. HAZARD.

The New Man in the Shop

GOSH! after a lot of fuss, I've got the blame thing going all right. There's more to this job than I ever saw in the book. Maybe I'm getting the hang of using what I've learned. But look at old Bill. Seems to have no trouble. Stops, looks for a little trouble, finds it, and goes ahead. Like sliding off a log. Sort of veteran, I guess, and mighty handy around here. Why can't a fellow like that give what he's got to the next green fellow? Sort of shop history.

That reminds me. Someone's had to do this job before me, I guess. Why couldn't I have a sort of record to look at, instead of wasting time asking questions?

This machine's pretty special, and not every guy has been at it. If some of the settings for speed and feed could have been put down for me to follow, I'd cut out all this experimenting.

But then, look at the loss of exercise for my brains. If a guy had a print with every detail and every direction, he'd quit thinking. —E. SIMONSEN.

HAVING experienced the "strange dog" feeling in a new shop, I feel that I am in a position to agree with Al, that a few introductions and preliminary remarks will go far toward easing the tension which always exists between a new man and the old employees.

Next to the proper manner of handling the new man proposition as shown by Al, I think the man on the job who, realizing the way a newcomer may feel, approaches him, hand out, a smile on a his lips, and performs a self introduction, is in the best sense a gentleman and to be admired.

Every shop has its own standard practices, and the more supervision a new man gets for the first few days the sooner he will be brought to a point where he can carry on a job without hesitation, or asking a lot of questions of the men around him. —OSCAR W. COOPER.

Applying the Budget to Small Tools

THERE is no doubt that small tools are badly misused in many cases. A few holes less before grinding would often increase production, because a tool in good condition will produce quicker, besides, less would need to be ground off to bring it into condition again, with consequent longer tool life.

There might be a tendency for day workers to slow down production slightly on a budget in order to make the tools last longer, but the pieceworker is not likely to reduce his earnings if additional tools can be obtained for the asking, even if an explanation is required. As a matter of fact I have known pieceworkers over here to provide their own tools where those supplied by the firm have been deficient in quantity or quality.

—A. F. GUYLER, *England*.

AN UNLIMITED supply of any commodity tends to lessen its value in the eyes of the user. To replace small tools involves expense; and the act of making out a blue ticket asking for more than the budget is a salutary reminder of the fact.

Ed's mental attitude, however, cannot be ignored. Williams should face this squarely, but tactfully. He must make it plain that the question of honesty does not arise. Most men are touchy on this point. His main object is to eliminate waste. As employer, this is his legitimate function. He can prove, moreover, that here employer and employee have identical interests. Waste of material is their common enemy. Incidentally, the blue ticket may indicate a falling off in the quality of supplies. —F. C. EDWARDS, *England*.

Consulting the Foreman on Tool Design

THE foreman should be consulted on the more intricate jigs, but he should not be bothered with the simpler and more obvious types of tools, or his whole time will be spent answering queries instead of maintaining production. Also, this latter course will give him a poor opinion of the intelligence of the design department.

There should be no rules as to time and place of consultation, but each designer should be encouraged to talk with the foreman if up against a difficult problem. These consultations will lead to a more practical solution of the problem in hand. It is in the initial stages of jig design that the foreman's advice is most useful, and not in the details. Neither should he be worried to initial every jig as suggested in the narrative. It is unnecessary to consult the operator regarding the design.

—E. J. SMITH, *England*.

Solving the Vacation Problem

CONTACT with a number of organizations in several lines of industry has convinced me that shop vacations are not only feasible, when properly planned, but have as well a very definite practical value.

Since by "shop" we mean the producing end of the business, we are unfortunately confronted with the necessity for keeping a balanced working organization on the job at all times, so that it is not always possible to allow individuals to exercise the latitude in the choice of time that office and executive help may enjoy; but experience indicates that with reasonable planning and a little co-operation all along the line, it is perfectly possible for all to have a real holiday with its unquestioned benefits, and still keep the wheels turning to good advantage.

—D. C. WRIGHT.

IN OUR shop we need the men to work steadily, as we have no slack period, and our vacation bonus plan has been very effective, as about 75 per cent of our employees have this year earned a vacation. A vacation of one week with pay is given to all employees who during a period of one year are not absent from their work in excess of 54 hours, except in case of sickness, in which case the workman shows a certificate from the attending doctor. Absence due to death in the immediate family is also excused. Absences from work, due to coming late or leaving early, are deducted from the 54-hour allowance.

The time spent on vacation must be convenient to the foreman, as it is evident that all could not go at the same time. We believe, after some years' trial, that the men are greatly benefited by the rest, and always anxious to earn it. —WILLIAM J. FISHER, JR.

Should the Shop Govern Purchases?

IT SHOULD be the aim of both the purchasing and shop departments to see that orders are placed to the best advantage with regard to both price and quality. This can be achieved by co-operation only. When a seller is invited to develop a suitable material to meet manufacturing conditions, it is usually on the understanding that orders will be placed if a suitable material is developed. Should experiments be unsuccessful, or should the prospective buyer place orders elsewhere than with the experimenting firm, the latter should certainly be compensated for the trouble and expense incurred.

—JAMES C. HARPER, *Scotland*.

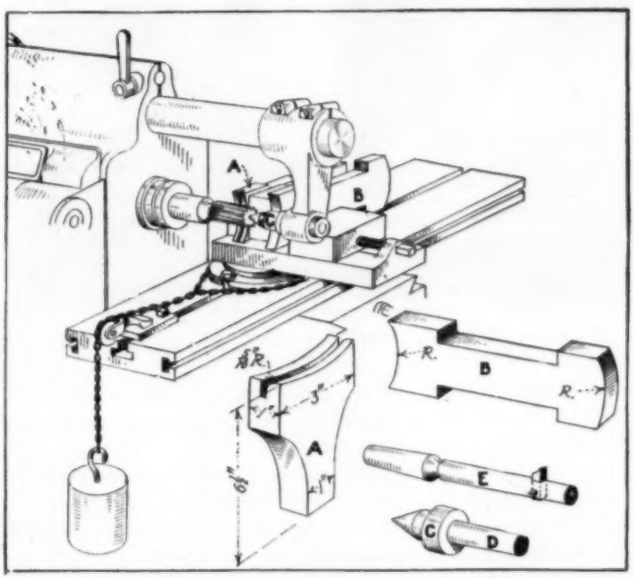
Ideas from Practical Men

The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upward, depending upon their merit

Making Staking Tools for Turbine Blades

By Charles A. Driscoll

Recently, I was given the job of making some tools for staking turbine blades in the rings of the rotors. On previous occasions, tools of this kind had been made in a large lathe or in a vertical boring mill. These methods seemed to me to be a long way around to secure the desired results. Since it would be too costly to make special fixtures and cutters for the job, we made a cheap device for doing the work in a milling machine.



Tools and set-up for milling staking tools

As shown in the illustration, the staking tool *A* has a slot in the end, one edge of which is rounded. Some tools were concave on the ends while others were convex, and the curves were anywhere from 15½ to 41¾ in. in radius. After coming from the blacksmith shop, the tools were machined, except for the radii, and slots were cut in the ends with a slitting saw ⅛ in. in thickness.

The tools necessary to do the work were: The double-ended templet *B*, made from ½x4-in. tool steel; the hardened roller *C*; the center *D*; and the formed fly cutter *E*.

The templet and the staking tool were held side-by-side in the machine vise, separated by a distance piece. The center was held in the overarm bracket and the roller was slipped over it. A cable passed around the base of the vise and over a pulley at the end of the table, carried a weight sufficient to move the vise, the holding bolts of which had been slacked sufficiently to allow it to slide.

With the end mill ground to the same diameter as that of the roller, the device was ready for work. The work was fed to the cutter and the vertical feed was engaged. Since the weight kept the templet against the roller at all times, the curve milled in the tool was of the same radius as that of the templet. Feeding for the depth of the cut was accomplished by tapping the outer end of the tool with a hammer. After the face of the tool had been milled, the fly cutter was substituted for the end mill. Repeating the former operation, the fly cutter formed the round on one edge of the slot.

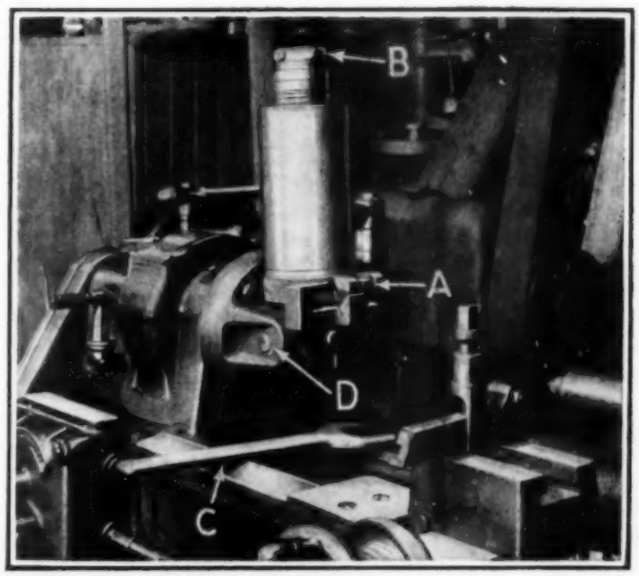
Obviously, the device is lacking in certain refinements, but it lived up to our expectations and did a very satisfactory pob.

Hinged Mandrel for Long Work

By Frank C. Hudson

Long work, such as sleeves that have to be turned on a mandrel, is usually awkward to handle in and out of the lathe. The work and the mandrel are generally too heavy to be handled by one man. If the mandrel is rigidly held in the lathe, the tailstock has to be moved twice—once when the work is put on, and again when it is taken off.

In the operation shown herewith, the sleeve for a Knight engine is being turned preparatory to grinding. The sleeve is held on the expanding mandrel shown,



Hinged mandrel for long work

which is hinged to its faceplate, as can be seen. The illustration also shows how the sleeve is positively driven by the pin *A* between the ears at the lower end of the sleeve.

The mandrel is expanded by operating the nut *B* at the upper end by means of the wrench *C*. When the mandrel has been expanded sufficiently for centering the work placed upon it, it is swung down into a horizontal position hinging on the pin *D*, and is ready receive the tailstock center. This arrangement is very convenient for handling the sleeves on and off the mandrel, since it avoids moving the tailstock, it being necessary only to move the tail spindle sufficiently to withdraw the center from the mandrel.

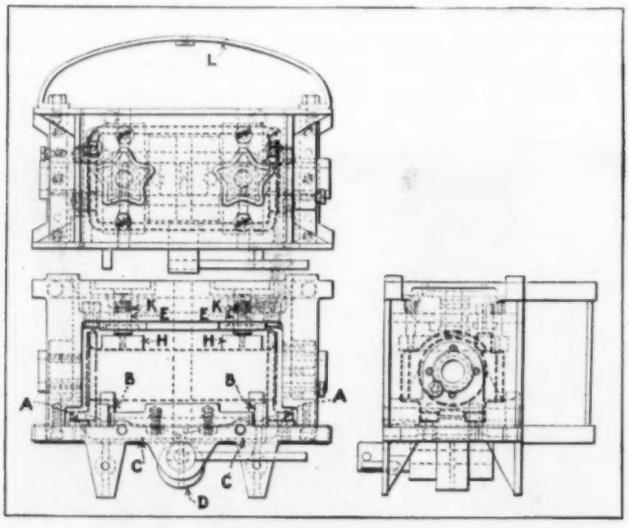
It is, of course, necessary to have the outside of the mandrel concentric with the lathe spindle, but it is not as necessary, as might be supposed at first glance, to have the hinge pin exactly in line. By truing the mandrel after it is in position in the lathe any ordinary misalignment of the hinge pin is unimportant. This device is in use in the shops of the Yellow Sleeve Valve Engine Co., East Moline, Illinois.

Drill Jig for an Irregularly-Shaped Casting

By Edward T. Heard

The jig shown in the illustration was designed for drilling a lot of castings of irregular shape. One of the castings in place in the jig, is indicated by heavy dotted lines. When placed in the jig, the casting rests on the hardened buttons *A*, and is located endwise by the stop pins *B*. It is centered by the wedges *C*, operated by the eccentric *D*, and is clamped in position by the screws *E* and the bars *H*.

To prevent the bars from turning when the clamping screws are operated, they are held by headless screws, so placed that they offer no resistance to vertical move-



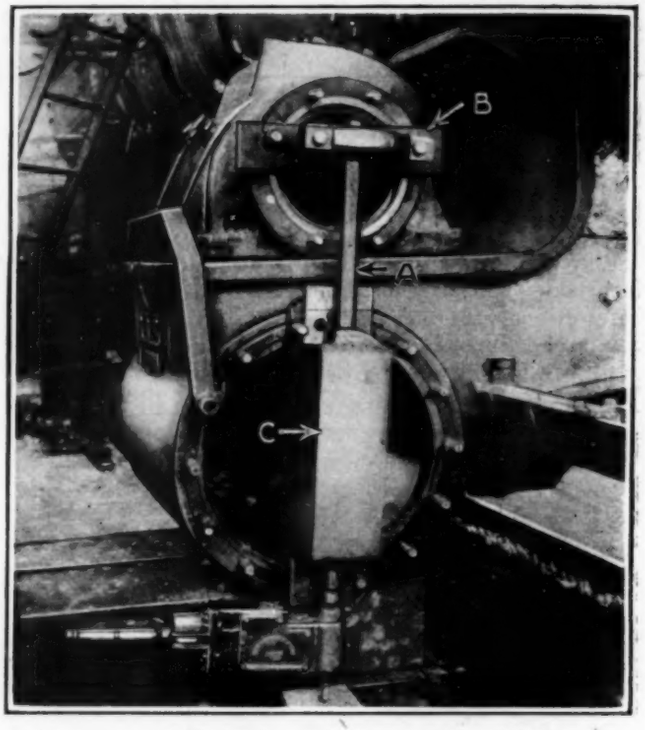
Details of the jig

ment of the bars. When the clamping screws are backed off to insert or remove one of the castings, the springs *K* lift the bars from contact with the work. Since the jig must be stood on both ends, alternately, for drilling the ends of the castings, the rockers *L* have been provided for rolling it over in either direction.

Device for Grinding Valve-Chamber Joints

By George H. Feltner

In applying piston valves to locomotives originally equipped with slide valves, it is necessary to grind the valve chambers to their seats in order to make a steam-tight joint. To do the work economically and to avoid



Air-operated device for grinding a steam-tight joint

hand labor as much as possible, the air-operated device illustrated was constructed in the Algiers, La., shops of the Southern Pacific Lines.

The air motor to be seen at the bottom of the picture drives the vertical shaft *A*, to the upper of which is attached an eccentric. The bracket *B*, attached to the end of the valve chamber, acts as an eccentric strap so that as the shaft is revolved; the valve chamber is moved back and forth. Fine abrasive and oil is used as a grinding medium. Attached to the cylinder is the bracket *C*, having bearings at the top and bottom for the vertical shaft.

Tooling for Turning a Spherical Surface

By Frank Waldo

The machining of spherical surfaces, both concave and convex, often presents a problem to the tool engineer. Many methods for handling such operations are in use, but they are not always adaptable to specific cases, therefore there are times when a different method must be sought. An example is the spherical boring of cast-iron differential housings, as illustrated in Fig. 1. The set-up is shown in a Gisholt simplimatic. The construction of the device is shown in Fig. 2. In operation, the carriage is brought to the machining position so that the pilot enters a bushing in the machine spindle. Then, the tool-block *A*, is fed inward so that the link *B*, attached to it, actuates the links *C* and *D*. The link *C* is pivoted to

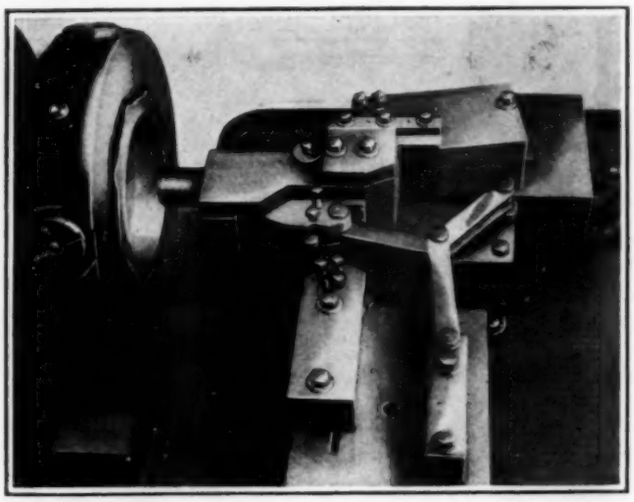


Fig. 1—Boring a spherical seat in a differential case

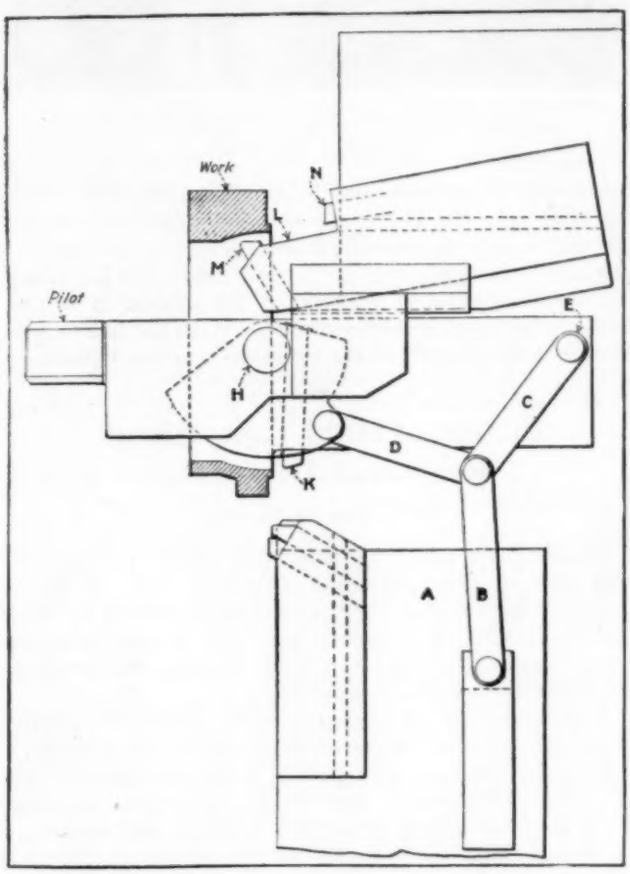


Fig. 2—Diagrammatic layout of the spherical boring tool

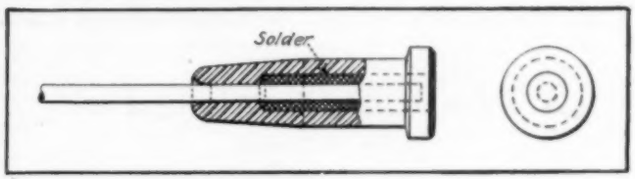
the auxiliary toolblock at *E*, and the link *D* is attached to the revolving toolblock which in turn is pivoted at *H*. Movement of the block *A* causes the cutting tool *K*, attached to the revolving block, to follow a circular path and to cut the spherical surface. The block *A* also has attached to it two cutting tools that machine the face of the case simultaneously. Felt wipers are attached to the auxiliary toolblock to keep chips and dirt from entering the slot in which the revolving toolblock slides. The auxiliary toolblock also serves as a support for the toolslide *L*, carrying the tool *M* for boring the straight part of the housing, and the tool *N* for sizing the lip on the flange.

Pull-Wire Sockets

By Henry Simon
Jena, Germany

Where small wire, such as piano wire, is used for transmitting a pull in a mechanism, it is the usual custom to bend or loop the wire at the end to fasten it. For ordinary pulls this practice is all right, but where the wire is subjected to severe and repeated stresses, the result will be failure of the wire near the looped end.

Some time ago a machine was designed in which it was expedient to use a piano wire. The wire made



Socket for a pull wire

several half turns around small sheaves while being under a heavy load. Since the wire, though its cost was practically nil, had to show a performance on a par with that of a hoisting rope under maximum working stress, it was given the same show that hoisting rope would have had, by providing it with proper terminals to pull from. The terminals were made as shown in the illustration. The wire passed through them in a straight line, the ends being held in place in a seat of solder of ample length. The reduced hole near the end of the socket is a few thousandths larger than the wire, and belled out near the tip as shown. These features prevent the occurrence of any bending strain if the socket should not be exactly aligned with the direction of the pull.

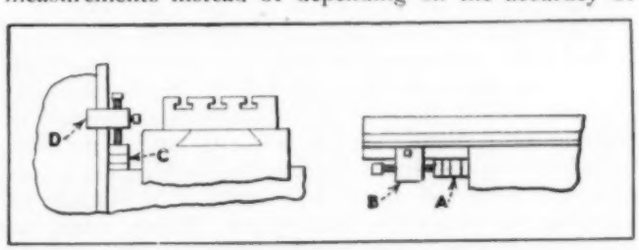
If the diameter of the hole is made smaller, the sockets can be thinner, since the merest film of solder will hold. However, unless there is some special reason for this, it is considered advisable to have ample space for the solder, since the formation of empty pockets is thereby rendered unlikely. The length of the solder seat should be from eight to ten times the diameter of the wire used.

Accurate Location and Drilling of Holes—*Discussion*

By Charles Kugler

In his discussion of the article under the title given above, on page 1006, Vol. 66 of the *American Machinist*, H. B. Schell evidently has not taken into consideration the time necessary to make two sides of the fixture square, and to balance the weight of the fixture on the faceplate.

I have been doing work of this class on an old knee-type milling machine, using Johansson blocks for linear measurements instead of depending on the accuracy of



How the blocks were placed

the screws. The blocks were used in the manner indicated in the accompanying sketch.

For horizontal measurements, the gage blocks *A* were placed between one side of the saddle and the clamp *B* attached to the under side of the table. For vertical measurements, the gage blocks *C* were placed between the top of the knee and the clamp *D* attached to the column of the machine. Both of the clamps were provided with adjustable stop screws that bore against the blocks.

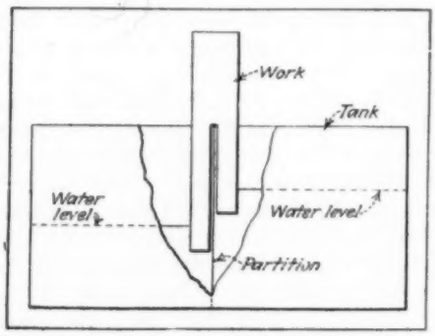
Of course, if Mr. Schell had no milling machine his method is all right. However, if a milling machine is available I think the method I have outlined is the better.

A Two-Depth Quenching Tank

By H. Moore

A somewhat puzzling problem in hardening was made simple by a tank so divided as to hold water at different levels in each compartment.

The work to be hardened consisted of tool-steel bars, each having a longitudinal slot cut in the center, leaving two legs. Afterward, part of the end of one leg was cut off. The requirements were that the ends of the legs only were to be hardened, the hardened portion not to exceed one-half inch in length on either leg. The tank was divided by soldering a piece of tin in the center, as shown in the sketch. Water was poured into the compartments so that its surface was higher in one than in the other, the difference in height being equal to the difference in the lengths of the legs. In quenching, the legs were straddled over the partition and the pieces were lowered until the bottoms of the slots rested on it, thus gaging the length of the part hardened.



Quenching tank with water at two levels

Quick Method of Rounding Pin Ends

By Oliver Franklin

In order to round the ends of creel pins used in textile equipment, the device illustrated was rigged up for a standard Sipp drill press having the usual hand feed through a rack and pinion. A hollow tool is used to do the actual forming of the round end and it is held in an ordinary drill chuck.

The creel pin is held in a spring-actuated chuck controlled in the following manner: A piece of strap iron, 1 in. wide and with an extension of about 18 in., is wrapped around the cap of the chuck and clamped in position by a single machine bolt and nut. The drill-press feed lever used in turning the rack pinion is extended at one end about 3 ft. until it is capable of touching the strap-iron chuck lever. Hence when the operator withdraws the rounding tool by throwing the feed lever over and back, the same motion causes the chuck cap to unscrew and thus release the pin. With his free right hand, the operator pulls out the finished pin and inserts an unfinished one. The pins are stacked in cans within easy reach. As can readily be imagined, considerable speed is obtained as the motion is so mechanical as to be almost automatic. With the hollow tool there is little danger of the operator injuring himself.

Double action of drill feed lever used in rounding pin ends

Fixture to Hold Taper-Shank Reamers—Discussion

By James McIntosh

In an article under the title given above, on page 67, Vol. 67, of the *American Machinist*, Jack Williams describes a makeshift for the method illustrated by Herbert N. Darling on page 505, Vol. 66. He also criticizes my suggestions on page 941, Vol. 66, as to what methods are generally used in production.

If a special set of reamers or any other tools having taper shanks are to be milled, it is usual to use a dividing head and to make a cut one side and then index for the other cut. This means that the flats are central and that when the machine is set for the depth of the cut it may be locked, and the stop set for the length of the flat. This is a toolroom method and dispenses with a makeshift jig. It also makes a stronger tang due to the fillets of the ends of the flats, the cut being made by a small-diameter end mill. Setting up the braces made necessary by the use of straddle milling cutters, in the case of Mr. Williams' methods, and the air space between pieces is a waste of time. This would not occur if the same cutter set-up were used to feed in on one or more reamers, as Mr. Darling describes, and the use of opposing fixtures with the cutter arbor between would be similar in efficiency with fixed stops, right and left. The feed time would be sufficient to change pieces on one side while the other side was cutting.

My letter was written to advise of modern methods rather than to condemn, since everyone does not know what special equipment is used.

Activity in the Metal-Working Industries

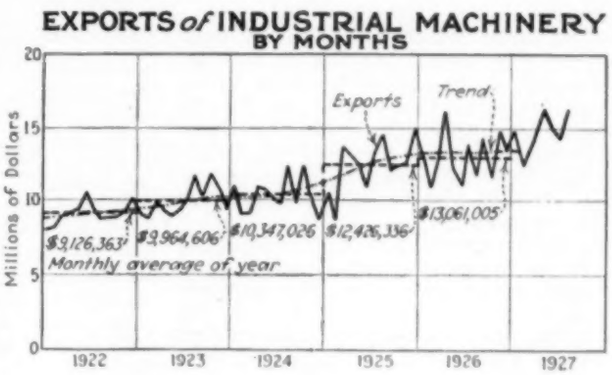
Production Now at Reduced Level

During the month of August productive activity in the metal-working plants of the country reached the lowest point since September, 1925. When corrections are made for the number of working days in the month it is found that the rate of production during August was about 5 per cent below that of July, and 11.6 per cent below that of August of last year.

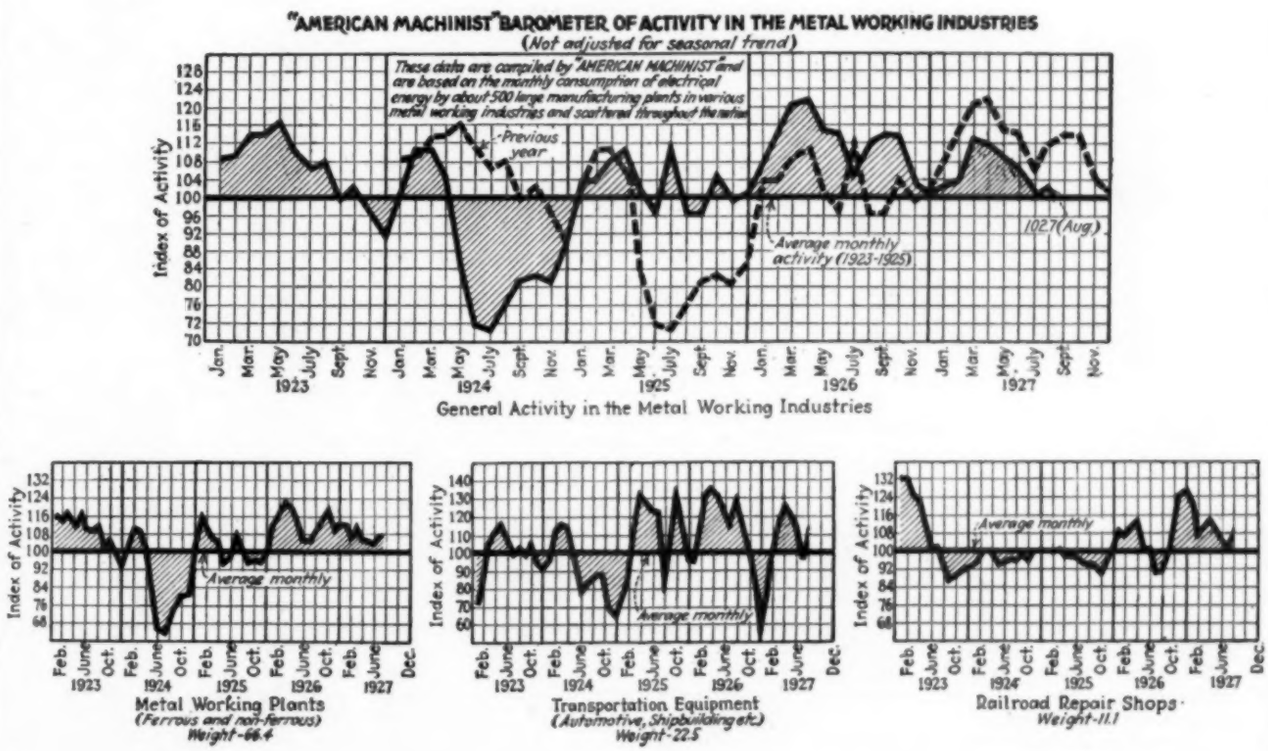
The materially increased operations which were manifest in the metal-working industries in August, 1926, were not recorded during this August. The ferrous and non-ferrous metal-working plants reached their peak of activity in March, since which time a continually decreasing activity has been reported. The August activity in these plants was about 15 per cent under that recorded during August of last year.

The activities in the automobile manufacturing plants during August were 6.5 per cent higher than those of July, but were 17.6 per cent below those of August of last year. These figures cover general operations in the automobile plants, including the making of parts, and do not necessarily represent actual production of motor cars for the month.

Activity in the railroad repair shops during the past summer months has been substantially higher than that reported for the same period last year. The August activity in these shops was 15.6 per cent higher than August of last year. All of these figures and conclusions are drawn from data on electrical energy consumption as collected by the *Electrical World* from a large number of plants throughout the country.



Industrial machinery exports show a continued upward tendency as reported by the Industrial Machinery Division of the Department of Commerce. July exports of industrial machinery totaled $17,073,000 which far exceeds that of July of last year. The largest gains were in oil-well and metal-working machinery.


"AMERICAN MACHINIST" BAROMETER OF ACTIVITY IN THE METAL WORKING INDUSTRIES
(Not adjusted for seasonal trend)
These data are compiled by "AMERICAN MACHINIST" and are based on the monthly consumption of electrical energy by about 500 large manufacturing plants in various metal working industries and scattered throughout the nation
Index of Activity
Previous year
Average monthly activity (1923-1925)
1027 (Aug.)
1923
1924
1925
1926
1927
General Activity in the Metal Working Industries
Average monthly
Metal Working Plants
(Ferrous and non-ferrous)
Weight-66.4
Transportation Equipment
(Automotive, Shipbuilding etc.)
Weight-22.5
Railroad Repair Shops
Weight-11.1

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Technical Abstracts

Boston and Albany Blacksmith Shop at West Springfield

The shop is divided into two sections, the larger of which houses the large hammers, furnaces, blacksmith fires and spring repair machinery; while in the smaller section is located the forging machines, a Beaudry & Bradley power hammer and two motor-driven Sturtevant blowers. The shop force consists of 45 men, headed by a foreman and his assistant.

As is customary all the dies are made in the blacksmith shop itself and they are kept in a separate building alongside of it. New main and side rods are made from single billets, no welding being permissible. Rods slightly bent are heated very slowly at the bend and then straightened. After straightening they are normalized.

Considerable attention has been given to the heat-treatment of locomotive parts and small tools. All new carbon steel, or carbon-vanadium steel forgings and all repaired forgings are normalized or air-annealed. After the forgings have been brought uniformly up to the desired heat, they are held at that temperature for at least one hour per inch of diameter or thickness, then removed from the furnace and allowed to cool freely in the air; they are never quenched in water or any other cooling medium.

Such small tools as large reamers and milling cutters are made in the toolroom from old axles and then sent to the blacksmith shop for heat-treatment. The tools are packed in Carbo-Pearlite and heated for eight hours at 1,500 deg. F. They are then allowed to cool over night in the carburizing box, after which they are repacked in the same material and held at the same temperature as before but now for seven hours, and then removed and quenched in salt water. The tools are then held for 4 hr. in an oil bath at a temperature of 400 deg. F. and afterward cooled. All furnaces used for heat-treatment are controlled by pyrometers. — *Railway Mechanical Engineer*, August.

Manufacture Closely Controlled

By the use of modern machine tools and a closely controlled schedule for the manufacture of standardized spur-gear reducers the W. A. Jones Foundry and Machine Co. of Chicago has reduced machine-hours by 60 per cent, and is now maintaining a comparatively flat production curve.

Production was placed on the basis of building parts for stock and then assembling, running-in and testing as orders were received.

A casting storage yard was provided where the rough-cleaned castings were allowed to age for about 30 days. This arrangement permitted the finish-cleaning and sand-blasting job to be performed more effectively and at lower cost due to the action on the sand and scale of the long weather exposure.

Greater accuracy became imperative, due to the requirements of interchangeability, and on this score wooden patterns had to give way to those made of metal. Standard roll-over, jolt molding machines and special stripping machines were installed.

In machining, many ingenious jigs and fixtures had to be devised and new machinery provided; as a result great savings in operating time and higher precision were obtained and practically all of the hand fitting that was necessary under the old methods was eliminated.

The casting yard acts as a flywheel, smoothing out the demand and supply curve between the foundry and the machine shop. The strain on standard machine tools was, of course, greatly relieved. Special production machinery was proportioned to normal demand and the stock of finished parts became a second flywheel, smoothing out the irregularities between times of most advantageous and economical shop production and the demand from purchasers.—Rogers A. Fiske, *The Iron Age*, August 4.

Industrial Possibilities in Russia Untouched

The desire to Americanize is probably one of the most notable developments in Russia today. While American equipment prices are higher than those in Europe on account of the higher wages of the American workman, the Soviet government seems inclined to use American machinery as far as possible on account of its high standard of quality.

As an example of this, the Freyn Engineering Co. recently has signed a contract with the Soviet government to render general consulting engineering services on all iron and steel plan construction and improvements for a period of five years, during which time the expenditure of about 360 million dollars is contemplated.

The contract comprises consultation, the preparation of general projects for the building of new plants and the reconstruction of existing plants, the preparation of detail drawings, bills of material and specifications for this work, and the supervision of plant construction by their engineers at the option of the Soviet government. Under the terms of the agreement the Freyn Co. will send to Soviet Russia its principals, engineers and specialists for consultation with the Russian officials and engineers. Russian specialists and engineers will be sent to the United States for the same purpose.

It should be remembered that in Soviet Russia the state controls and operates the iron and steel industry in its entirety. The tendency is toward its decentralization and it is expected that certain products will be assigned to certain mills better located and equipped to accommodate the corresponding district than others. Russia hopes to benefit by the experience of the United States which has developed its iron and steel centers due to the influence of various economic forces.

An important part of the Freyn company's contract will be the erection of three new iron and steel plants each with an ultimate capacity of 750,000 tons of ingots per year. As far as possible the equipment of these plants will be duplicated and standardized.—H. J. Freyn, *Iron Trade Review*, Aug. 18.

Diamond Boring in Locomobile Production

For nearly five years the Locomobile Co. has been using diamond boring in the production of its cars and has found it to be a very satisfactory system, not only because of the great accuracy of the work but also because of the long life of the boring tools.

The boring of both ends of connecting rods and their bearings, of the crankcase for main shaft and camshaft bushings, is done in standard machine tools with special fixtures. A ground and lapped segment whose inside diameter is that of the boring bar and whose outside diameter is that of the hole to be bored is employed to set the diamonds in position. The segment is placed on the bar, adjacent to the cutter, and a reading is taken with a dial indicating device mounted on a V-block. The diamond is then adjusted until the reading is the same as that obtained from the segment.

The crankshaft liner holes are bored 0.006 in. undersize before coming to the diamond boring operation. The tools are run at 240 r.p.m. and the feed is held to about 0.005 in. per revolution. The seven crankshaft holes are bored at one operation and in the next operation the four camshaft holes are finished. Crankshaft liners are then fitted and camshaft bushings are pressed in. Both liners and bushings are babbitt-lined and bronze-backed. They are finish bored in two operations, as before, 0.012 in. stock being removed in one cut. The bars are run at a speed of 270 r.p.m. in the finishing work, while the feed is about 0.0025 per revolution.

In the fixture for boring connecting rods both ends are rough and finish

bored simultaneously, the roughing cutters entirely clearing the work before the finishing cutters commence. For the large end, the roughing cutter is of high-speed steel and $\frac{3}{8}$-in. is removed from the bore. The finishing cutter is a diamond and it removes about 0.006 in. The boring bar for the big end is run at 520 r.p.m.

For the pin end of the rod both roughing and finishing cutters are diamonds. The roughing tool removes 0.010 in. and the finishing removes 0.004 in. The boring bar runs at 700 r.p.m. and the feed is approximately 0.002 in. per revolution.

With ordinary care diamonds have been run for three to six months without re-dressing.—N. A. Jagger, *Automotive Industries*, Aug. 13.

Wear Resistance of Cutting Edges of Blanking Dies and Shear Blades

The shearing and blanking of sheet steel covered with hammer or roll scale will dull or wear down the cutting edge of die parts and shear blades and produce a burr earlier than when the scale is absent. Hammer scale is an abrasive material and quite hard when compared with the hardness of low-carbon steel. However, since the scale-free material is impractical to be obtained for economical and commercial reasons, the use of heavy clinging or highly adhesive greases as lubricants has been found to practically neutralize the scoring tendency of the scale. Furthermore, it has been recognized that the imbedding of the crushed crystals of iron oxide scale and the prevention of their pulverization, spreading and lodging between the cutting edges, is responsible for improved performance.

The successful application of uniformly hard movable and stationary die parts depends to a large degree upon the rigidity of the punch while blanking. On outline dies where the entire perimeter of the punch section is used for the cutting edge, the tendency to produce a side thrust reaction is practically nil, and a hard punch-hard dieplate combination will work out ideally. For dies where the punch is cutting on one side of the cross section only, the soft punch is favored. Since no clearance whatsoever can be allowed between the punch and the dieplate, a tremendous pressure is exerted upon the cutting side of the punch during blanking. The grinding effect introduced by a hard punch is greater than from a soft punch, resulting in a dull edge and producing a burr, after comparatively few drops. The softer punch being less abrasive upon the cutting edge of the dieplate insures longer life and, therefore, is favored on dies of this class.

Uniformly and fully hard die parts offer many advantages with regard to quality of the blank produced as well as from a quantitative production standpoint. Plastic deformation not evidenced by burr formation is produced by the use of soft punch parts, which deformation may at times be more detrimental than a localized bag resulting in a burr. The type of steel now most favorably considered for blanking dies and shear blades is the high-carbon high-chromium type of tool steel containing approximately 2 to 2.25 per cent carbon, and 10 to 12 per cent chromium. The steel will have a scleroscope hardness of 85 to 95 on oil quenching from 1,800 deg. F., and tempering at 600 deg. F. It also has nondeforming characteristics.—W. J. Merten, *Transactions of American Society for Steel Treating*, August.

How the Westinghouse Plant Gets Maximum Service from Electric Industrial Trucks

A dispatch plan that provides adequate control and efficient service has been in successful operation since Jan. 1, 1926, at the East Pittsburgh Works of the Westinghouse Electric and Manufacturing Co. Under the old plan there was no co-operation between departments for mutual benefit. Trucks would take loads to other sections of the plant and return empty. There was no practical way of knowing whether return loads could be secured and this naturally limited the trucks to a maximum efficiency of 50 per cent.

The plant has a fleet of some eighty-five industrial trucks of the electric storage battery type. Nearly all of them are of 2-ton capacity, with speeds ranging from three to five miles per hour. These trucks were added gradually since 1912, when the first of them was placed in operation, only when specific applications occurred in the different departments of the plant. The trucks were usually assigned to the larger departments; consequently in order to get any service at all, it was necessary for the smaller sections to plead with the larger sections for the necessary service, which usually resulted in resorting to hand-trucking in order to avoid expensive delays. There were also a number of other undesirable and inefficient features of the plan under which the trucks were previously operated.

The whole idea behind the dispatch plan is one of centralization of control. After careful study it was deemed wise to divide the plant into four areas and place a dispatcher in each area who in turn could report to one general dispatcher. The process of reorganization was brought about gradually by organizing one station at a time. Only a few trucks were used as a nucleous for starting this dispatch station, after which other trucks supplying service to nearby sections were gradually added until a certain area was covered. Later three more dispatch stations have been organized which together with the first one supply industrial truck service to all points within the plant.

The standard equipment for a dispatch station consists of a dispatch board, telephone, desk, dispatch tags, and sufficient number of skids to handle transferable material. The station serves as a center of material handling and a point from which all requests for moving material from this area are answered. Instead of each section dealing directly with the trucker, they simply phone in their requests to the station dispatcher. As these requests come in, the dispatcher or station clerk records them on a small dispatch tag. Ordinarily the dispatcher requests only two items of information, namely, the quantity of material to be moved and between what points it is to be transferred. The time when the load will be ready is also recorded on the tag, but usually loads are not reported until they are actually ready.

The tag is placed on a dispatch board divided vertically—into half-hour spaces and horizontally—according to shop sections. "Rush" orders must be reported to the dispatcher by some responsible person, usually the foreman; to avoid any duplication of reporting, one individual from each section is made responsible for reporting all loads.

As the trucks report at the station they are given loads according to the order in which they appear on the board.

Combinations of partial load shipments are made in such a manner that full loads may be secured for approximately the same place.

With the present dispatch plan, a certain number of trucks are assigned to each station. However, their work is not confined to delivering material from this one district alone. Whenever a trucker delivers material into another area, he reports at the station in this area, where he is given a return load to be delivered to some point within his own district. This has increased the loading capacity of the trucks considerably.

A report of each trucker's efficiency is posted once a month. Each vertical column on his chart represents the number of loads the trucker has hauled per hour during the respective month. A similar record is kept of the work and progress of each dispatcher, which is simply a combined record of all the trucks reporting at one station. Quite a bit of rivalry is shown by the dispatchers in keeping their curves up to the highest point possible.

At present, forty-eight truckers, two helpers, four station clerks and four dispatchers are employed in the operation of the dispatch system. Truck service to this same territory previously required fifty-four truckers, nine helpers and one group leader. This represents an hourly savings of $3.47 or approximately $700 per month. A number of the trucks have not yet been placed on the dispatch stations, but already the amount of work handled has increased 50 per cent.

The next and possibly biggest step toward reducing the cost of this type of material handling will be the substitution of an incentive wage-payment plan for the present day-work plan, whereby the trucker may share in the benefits derived from increased efficiency. This, incidentally, is another argument in favor of the dispatch system, for it will simplify the operation of such a wage-payment plan.—R. E. Jansen, *Industrial Management*, August.

American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

How Is Your Heat-Treating Equipment?

IT IS not uncommon, at this age of highly-efficient organizations, to see a heat-treating department made up of inadequate equipment positioned in some improperly located corner of the shop, while other departments are composed of up-to-date machinery and tools properly laid out to conform with modern developments. An unusually clever undertaking may often be seen in the machine or assembling department of a manufacturing plant, but the heat-treating work in that same plant may be carried on in a smoky room with dirty floors where men perform unnecessarily laborious tasks, and where a generally disorderly appearance is seen, making one feel as if he wanted to hurry out of the department. The machine-shop budget may often call for an expensive unit that will increase the output of a certain operation of a specific part, but the heat-treating department is sadly neglected and generally has to function as well as it can with existing equipment.

Savings effected in the heat-treating department are as valuable as those gained in other sections of the shop. And in some cases they are of greater benefit when careful consideration of the finished product is made, especially when uniformity is important.

Helping Customers Order Correctly

INCORRECT ordering and misunderstanding of orders after they are given, are causes for much annoyance and expense in all lines of business. Standard names for machine parts would be a great help in preventing many of these errors, and it is to be hoped that an acceptable standard nomenclature may be devised. The exact name is not nearly so important as that all of us recognize it as meaning the same thing.

In the meantime manufacturers can aid in preventing mistakes and misunderstandings by making it as easy as possible for the customer to place an order. Diagrams showing what dimensions should be given and stating the names of parts that might cause confusion, would be helpful. By giving the standard dimensions, by stating plainly that these will be furnished unless otherwise ordered, and that other sizes are supplied only at special prices, much delay and confusion could be prevented.

The Welding Eye

MANY a designer has failed because of his inability to visualize a piece in the light of new methods. A case in point is the difficulty of visualizing a structural member as anything but a riveted unit. If the designer is unable to break away from the traditions of riveting practice he cannot hope to attain the success that would reward him otherwise, because a member of a riveted assembly that has been modified to be welded is never as economical or as satisfactory as one that was laid out primarily to be welded.

Anyone can call to mind many similar instances in other fields of design but the example chosen is significant because of the growing importance of welding as a metal working process. It is so new that experience is often unable to solve small problems. The exercise of gray matter that must take the place of experience in such a case never hurt anybody yet. It must occur behind eyes that are not blinded by rivets.

Effects of Restricted Immigration

FIGURES just released by the National Industrial Conference Board and based on an analysis of immigration show that the present law is producing some at least of the results desired. Immigrants from English speaking countries now constitute nearly half of the total as compared with only an eighth ten years earlier. Not so many are coming from Great Britain and Ireland as came before the war but the loss is offset by an increase in the arrivals from Canada and Newfoundland, which is probably a good thing considering the respective mental attitudes of dwellers in the old and new worlds.

As was expected there has been a net loss of Italians who, before the new law took effect, constituted the largest single group of immigrants. The number coming in now would be still smaller were it not for the provisions that exempt families of citizens and ex-service men from the quota restrictions.

Obviously, the vital necessity of mechanizing industry in the United States which was predicted when the present law was passed has been fully realized. The responsibility, and at the same time the opportunity, of the builder of machinery is very clear.

Shop Equipment News

Improved Niles 90-Inch Locomotive Axle Journal Turning Lathe

IN ADDITION to the principal functions of turning journals and facing hub liners on locomotive and trailer wheel axles, the 90-in. locomotive axle journal turning lathe built by the Niles Tool Works Co. Division of the Niles-Bement-Pond Co., 111 Broadway, New York, is readily adaptable to receive a wide variety of attachments for other operations in connection with locomotive wheel sets.

These include devices for the single or double quartering of wheels with crank pins 90 deg. apart. When these attachments are furnished, the utility of the machine may be further increased by the addition of crankpin turning and burnishing attachments, either single or double. These consist of revolving crankpin heads of the box-tool type, each carrying two tools, mounted on special bases on the bed. The heads are clamped to the quartering spindles. Burnishing tools with shanks arranged to fit the tool slots in the crankpin heads are regularly furnished to secure the desired finish after the turning operation.

The quartering and pin-turning attachment for the tailstock or right-hand head may be removed to the rear of this member, a pad being provided for its reception, which gives it the correct location, in conjunction with the left-hand attachment, for double quartering or pin turning of wheels with left-hand leads. Adjustment for engine stroke from 22 to 40 in. is provided for in this mechanism.

For the quartering or pin-turning operation the wheels are centered on auxiliary centers, and are supported by two V supports vertically adjustable by means of screw and worm gearing. Each of these supports carries a slotted extension bracket to which the wheels are clamped when the correct radial setting has been obtained. This setting is facilitated by a turnbuckle link, one end of which is fastened to the wheel, the other to the bed. These brackets also embrace an adjustable outboard bearing for each quartering spindle, thus making a very rigid support for the bar when boring crankpin holes.

The increasing adoption of 3-cylinder locomotives on many of our railroads has made it necessary to modify the machine to accommodate wheel sets from these engines. To turn the journals of inside crank axles a special rest with narrow slides may be furnished. It is interchangeable with the regular journal rest, and power feed movements apply to it also. The two journals may be turned at one setting without the necessity of reversing the wheels in the machine.

The double crankpin turning or "quartering" of 3-cylinder engine wheel sets presents another problem, and to meet this situation the base of tailstock quartering attachment is tilted by means of a 30-deg. wedge block which is the range of difference between cranks with 90-deg. and 120-deg. leads.

An attachment for re-turning the outside diameter and lipping for tire seat of mounted wheel centers is also being applied to one of these machines. It consists of a special rest having considerable transverse travel to handle wheel centers from 38- up to 72-in. or more in diameter. It is located near the faceplate and operates on one wheel center at a time. Power feed is available, the mechanism being connected to the main feed shaft. Crankpin grinding attachments and center crankpin turning attachments have also been developed to further increase the scope of the machine.

To ensure true and round journals the wheel sets are revolved on dead centers, the only rotating member be-

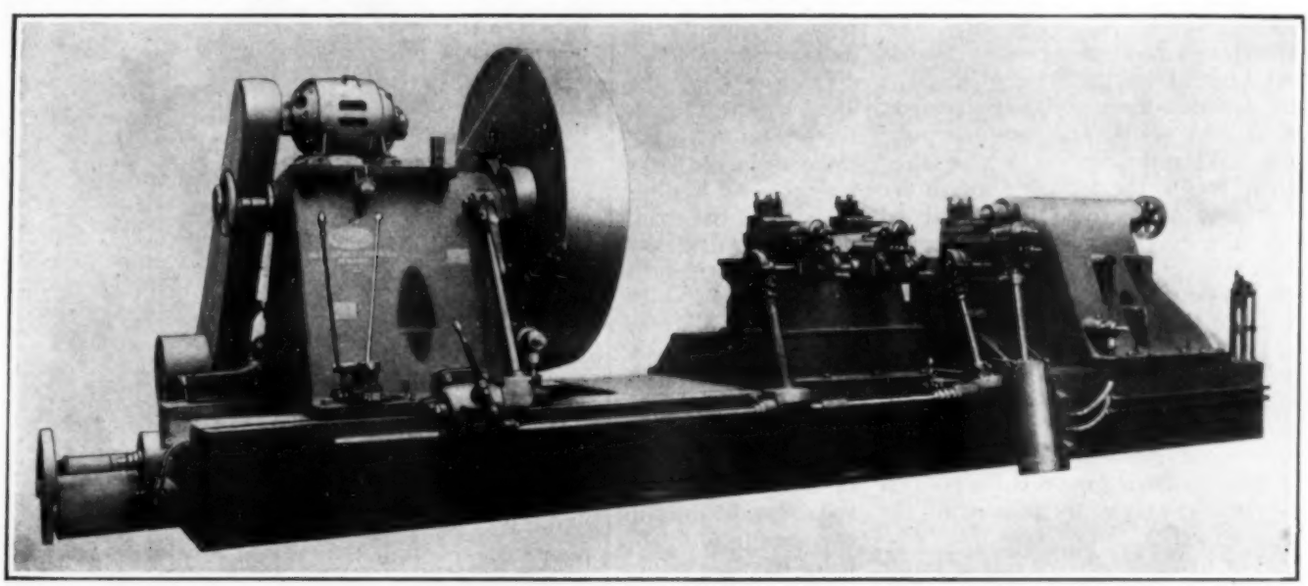


Fig. 1—Improved Niles 90-Inch Locomotive Axle Journal Turning Lathe

Shop Equipment News

ing the faceplate, which is carried on a large bronze bushing. This principle is recognized as one ensuring accurate work and is embodied in the majority of cylindrical grinding machines. The elimination of gear marks on finished journals has been attained by driving the faceplate by belt, the faceplate acting merely in the combined capacity of pulley and driving member to rotate the wheels. There are no rotating spindles subject to wear and sliding spindles carrying the centers can be locked in position for greater rigidity.

The drive is by a 15-hp. motor, either constant or variable speed. Mounted on the jackshaft at the rear

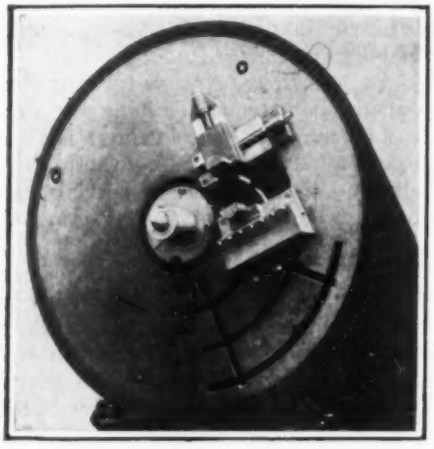


Fig. 2—Driver dog for improved Niles Journal Lathe

of the machine is a friction clutch and gear box giving, when a constant-speed motor is employed, four changes of faceplate speeds. Speeds are varied from the front of machine by a clutch lever and selective gear shift lever similar to automobile practice. When the drive is by a variable-speed motor, the faceplate speeds are increased or decreased electrically.

Completely inclosed in the faceplate is a counterweight adjustable to suit the maximum counterbalancing of the heaviest wheel sets. The counterweight is a single casting, the adjustment in or out being simply made by turning one screw. The weight is guided in two T-slots. A slot is cut in the plate through which protrudes a pointer showing the relative position of counterweight in respect to the spindle axis.

The improved driver dog is in the nature of a two-jaw chuck. The jaws are tightened onto the crankpin and are lined with copper to prevent damaging the finish on the pins. For trailer wheels and driving wheel sets having no crank pins fitted, an extension piece is clamped between the jaws and it projects through the spokes or pin hole to drive the wheel set.

Both the headstock and the tailstock are traversed along bed by power, 5-hp. motors being used for this purpose. Lateral adjustment is necessary for these members to manipulate wheel sets in and out of machine. Limit switches are provided to automatically shut off power from the traverse motors when the heads have reached the limit of travel.

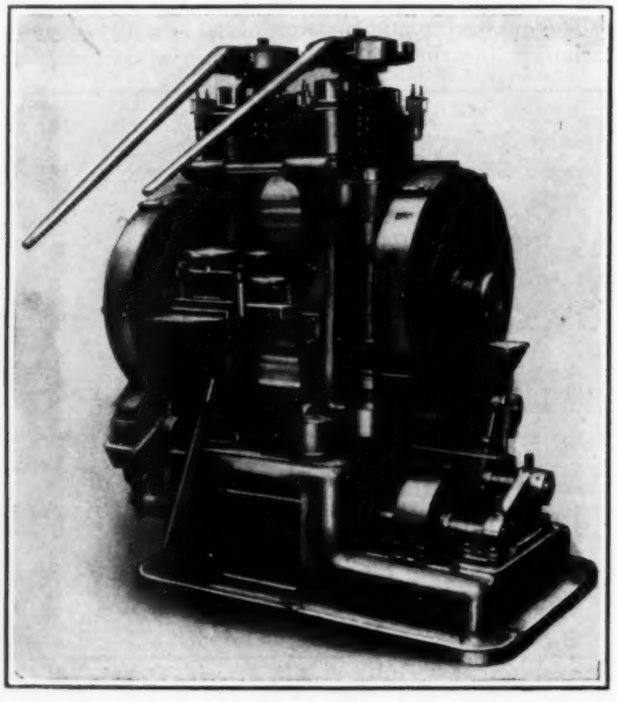
The outside journal rest may be swung into position, or out of the way when not in use, by a pneumatic cylinder. There is no muscular effort necessary on the part of the operator to accomplish this except the insertion or removal of two clamping bolts and the turning of the air valve. Outside journals up to 12 in. in diam. by 16 in. long may be turned, but only one journal at a time, it being necessary to reverse the wheels in the machine to turn the other journal.

Standard 4-High Rolling Mill

THE Standard Machinery Co., Auburn, R. I., has recently placed on the market a 4-high rolling mill for the rolling of thin-gage material. The design of this mill is based on the principle that for the rolling of thin-gage stock small diameter rolls are desirable. The difficulty heretofore has been the lack of rigidity and the inability to establish a proper drive with small rolls.

In the improved mill the working rolls are made 1½ in. in diameter or larger, depending on the thickness of the stock to be reduced. In the mill shown in the illustration the baby rolls are 3 in. in diameter and 8 in. face. They are backed up by two rolls 16 in. in diameter and 8 in. face. These backing-up rolls are mounted on roller bearing journals, and are friction driven from the small rolls. The exceptionally large diameter of the backing-up rolls as compared with the small rolls assures rigidity and radiates the heat from the baby rolls. The baby rolls may be removed by one man in approximately five minutes, and the drive is so designed that various diameters of baby rolls may be used in the same mill. The baby rolls are water cooled. The mill is equipped with stock wipers and guards.

In comparison with the conventional type of 2-high mill, or with mills having large diameter working rolls, there are claimed to be the following advantages: The material can be reduced in approximately one-half the number of passes; the small diameter working rolls do not harden the material and consequently a great amount of annealing is eliminated; there is no tendency for the stock to be thicker at the center than at the edges; the floor space is reduced one-half; the power requirement is reduced one-half. Strip stock, hard from previous rolling, has been materially reduced in thickness in this mill without annealing and without cracks.



Standard 4-High Rolling Mill

Shop Equipment News

Societe Genevoise No. 3 Jig Boring Machine

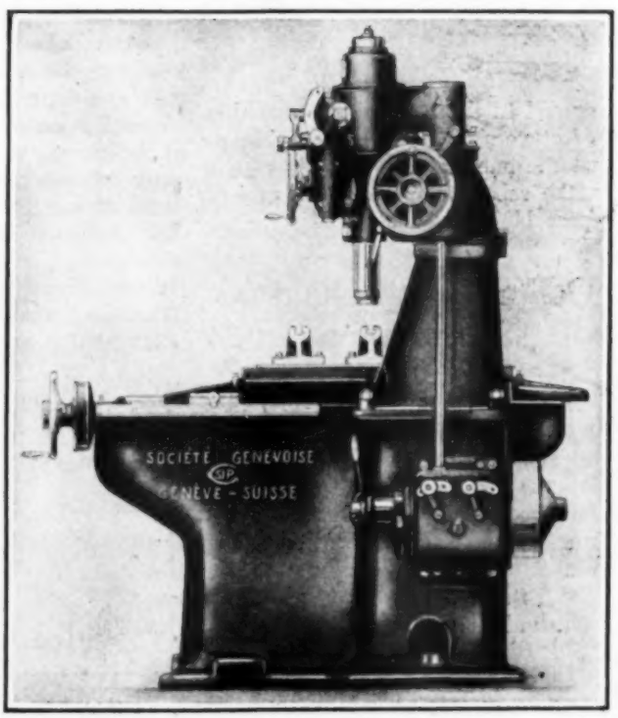
THE Societe Genevoise D'Instruments de Physique, Geneva, Switzerland, through its American agent, the R. Y. Ferner Co., Investment Building, Washington, D. C., is placing on the market a jig boring machine midway in capacity between its models Nos. 2 and 4. The model No. 3 machine, shown in the illustration, is similar to the larger machines in design, having a table moving on ways on the bed of the machine with uprights on each side of the table which are connected by a cross rail. The boring head is mounted on a slide moving on this cross rail.

The cross rail, however, differs from those of the larger machines in that it is not raised and lowered but connects the uprights rigidly. The table measures 16x24 in., and has a travel on its ways of 16 in. The cross travel of the spindle slide is 12 in. The maximum height of the boring head above the table is 12 in., but as the feed travel of the spindle is 6½ in., it is possible to bring the drill or boring tool close to the table. For flat work two cross rails are provided, and these can be attached to the top of the table by clamps furnished with the machine. On these rails the flat pieces may be mounted to bring them within the range of the tools.

The principles of measurement used are the same as in the company's other jig borers, that is, by use of accurate micrometer screws, automatically compensated for errors. The pitch of the screws is 10 threads per inch, and the micrometer heads are graduated to 0.0005 in., and are read by vernier up to 0.00005 in. The accuracy of displacement of the table or cross slide is guaranteed to be within 0.0002 in. The error of distance apart of holes for this machine for the maximum distance apart of 20 in. is guaranteed to be less than 0.0006 inch.

The boring head has a long feed and is of heavy construction, giving a large drilling and boring capacity. It is equipped with a No. 3 Morse taper. Reduction sleeves having No. 1 and No. 2 Morse tapers are also supplied with the machine.

The spindle is provided with a special device permitting the use of chucks to hold tools with straight shanks up to ⅜ in., in diameter. The maximum drilling capacity of the machine is 1 in. for soft steel, 1½ in. for cast iron, and the maximum boring capacity is 4 in. Three automatic feeds of the spindle are provided, 0.003, 0.005 and 0.008 in. per revolution. The gear feed is controlled by a single lever for throwing it in or reversing it. A strong thrust ball bearing takes up the axial thrust of the tool. Lubrication of the spindle is by a sight oil feed. Speeds of 75, 150, 300, and 600 r.p.m. are provided for the spindle. All shafts are mounted in ball bearings and all gear housings are provided with an oil bath.



Societe Genevoise No. 3 Jig Boring Machine

A special circular table for use on the machine is provided when desired. This table has a diameter of 13¾ in. and is operated by a worm screw giving the table 2 deg. of rotation per revolution. The dial can be read to 5 sec. of arc by a vernier. Other accessories of the machine include a microscope to be mounted in the spindle for checking work or locating the spindle over a given point. A centering dial indicator for locating the circular table or centering work on it is also supplied, as well as a center punch tool. Three adjustable boring tools are also furnished. The overall dimensions of the machine are 51x57 in. by 72 in. high. It has a net weight of 2650 pounds.

Hilo Industrial Lacquers

A line of industrial lacquers has recently been announced by the Hilo Varnish Corporation, Marcy and Flushing Aves., Brooklyn, N. Y. These lacquers are said to be made from the purest and most suitable raw materials and have a mild, harmless odor when fresh. The tendency to blush has been practically eliminated and the finishes may be used under adverse weather conditions. The tendency to lift undercoats is said to be reduced to a minimum. On a properly cleaned surface these lacquer products are said to adhere with unusual tenacity. It takes three to four hours to dry between coats, but the speed of drying may be hastened by the application of a moderate amount of heat.

The lacquer is made in several grades. No. 10 Clear Spraying Lacquer is a pale, heavily-bodied lacquer suitable for use over wood or metal. Two or three coats are necessary. No. 11 Clear Brushing Lacquer is a well-bodied, clear lacquer that may be applied by brushing or spraying. It is thinner than the No. 10 but contains more solids or film-forming material. It drys in about four hours. The No. 15 Clear Flat Lacquer is a transparent dull-drying lacquer and is said to give a pleasing rubbed effect without the labor and expense of rubbing.

The No. 25 Gloss White Spraying Lacquer is a white lacquer enamel and dries with a good gloss while the No. 26 Gloss White Brushing Lacquer gives a somewhat higher gloss and a fuller coating may be applied

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by brushing. No. 30 Eggshell White Spraying Lacquer is similar to No. 26 Gloss White Spraying with the exception that it dries to an eggshell finish. A dull white finish is obtained with the No. 35 Dull White Spraying Lacquer.

A black lacquer that dries with a fairly high luster and covers solid in one coat is the No. 50 Gloss Black Spraying Lacquer. It may be applied directly on metal or wood and adheres to all clean surfaces. The No. 51 Gloss Black Brushing Lacquer is slightly thinner in body but produces a fuller coating. It dries with a slightly higher luster and can be applied by brushing, dipping or spraying. It may be used on almost any surface and is suitable for any work that does not receive continuous exterior exposure. Other black finishes are No. 55 Eggshell and No. 60 Dull Black Spraying Lacquers.

Colored lacquers are also available in two qualities, one suitable for spraying or dipping only, and one that can be brushed, sprayed or dipped. A wide series of colors is available. A lacquer thinner is also made.

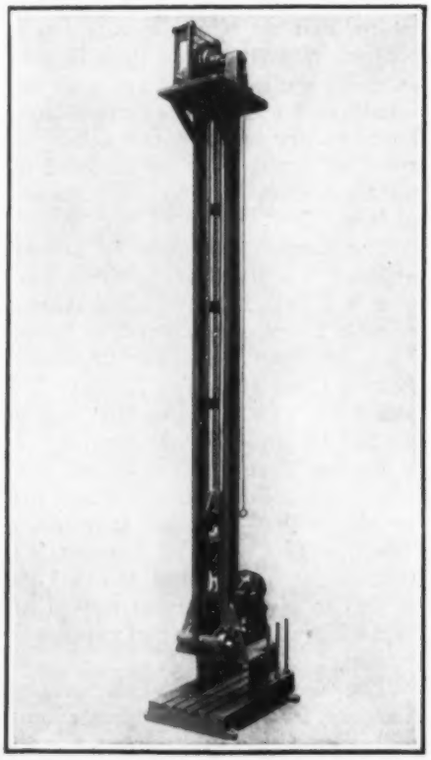
Olsen-Charpy Impact Testing Machine

THE Tinius Olsen Testing Machine Co., 500 North Twelfth St., Philadelphia, Pa., is placing on the market the impact testing machine illustrated. The machine is designed for testing gear teeth by impact, but can also be used for testing other materials.

The machine has a heavy cast-iron base, with machined T-slots for holding the work, and is intended to be bolted to a cement pedestal in the floor. The column is designed to permit a full drop of 10 feet. The hammers used are of 20 and 40 lb., and the machine is arranged for a 1 ft. minimum drop. The pedestal is clamped to the base by means of six long bolts, which permit blocking up so that gears up to 2 ft. in diam. can be tested.

The column consists of two steel channels, on which are mounted the cast-iron slides. A roller chain, operated by the motor at the rear of the machine, automatically lifts the hammer and again trips it, causing it to drop 1 in. higher at each blow. The height is read directly in inches on a steel tape, which is an integral part of the machine. The hammer can be adjusted by hand to start at any specified height.

For testing the gear, it is mounted in a sub-press, which in turn is clamped to the base of the machine. A feature claimed for the machine is that the hammer is positively caught on the rebound by the chain and no repeat blows are delivered.



Olsen-Charpy Impact Testing Machine

Gallmeyer & Livingston 8-Inch Jointer

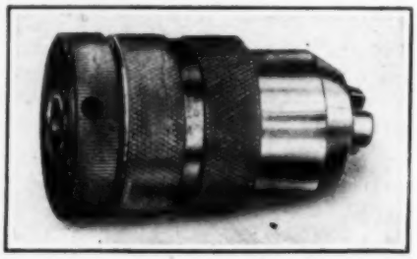
The Gallmeyer & Livingston Co., Grand Rapids, Mich., has announced the 8-in. jointer illustrated, featuring the motor on the arbor. The machine is shown mounted on a portable truck-type pedestal base, but it is also supplied as a bench-type machine.

The rabbetting groove in the rear table and the vertical adjustment of the front table makes is possible to rabbet up to ½ in. on this machine. Both front and rear tables may be conveniently adjusted. The machine is equipped with a ball-bearing repulsion induction-type motor mounted on the arbor, and with three knives 8¼ in. long. The fence is easily adjustable and the knives are carefully guarded. The machine is 44 in. long with a 24-inch front table and an 18-in. rear table.

Gallmeyer & Livingson Jointer

Ettco Keyless Drill Chuck

An improved keyless, self-tightening, ball-bearing drill chuck has been added to the line of products put out under the trade name "Ettco" by the Eastern Tube & Tool Co., 594 Johnson Ave., Brooklyn, N. Y. The chuck has a continuous grip and does not depend upon the operator to tighten it sufficiently to hold the drill. It is only necessary to close the chuck by hand after which it takes its own grip and as the drill point goes deeper into the work, the grip becomes tighter. It also increases with greater feed or with hard spots in the metal. It is claimed that no matter how tight the chuck's grip, it can be released by hand by a quick twist of the wrist.



Ettco Improved Keyless, Self-Tightening Drill Chuck

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Also due to its construction there is said to be less slipping so that wear on the drill shank and chuck jaws is reduced.

The chuck has been designed for use on electric or air drills and can also be used to advantage on flexible shaft units. The holding collar on top of the chuck is held by the operator to prevent the drill from turning when opening or closing the chuck. This device is said to eliminate certain abuses that electric drills are subject to, such as using a nail in the ventilating holes to prevent the armature from turning. This chuck is furnished with any thread or tapers to fit all standard makes of electric or air drills on the market.

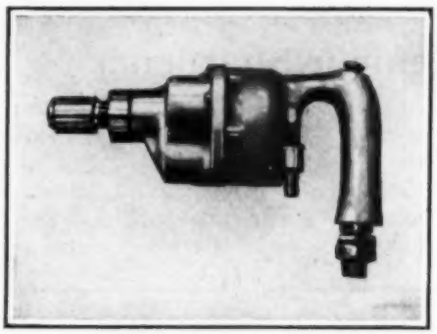
Bethel-Player Lapping Head and "Newgrit" Abrasive—*Erratum*

In the article on page 369, Vol. 67, of the *American Machinist*, describing the above equipment made by the Bethel-Player Co., Inc., Westboro, Mass., the erroneous statement was made that the lapping head could be restored to its original shape and diameter by re-turning in a lathe with a diamond tool. As a matter of fact, the tool works on the safety-razor principle in that, when worn out beyond the limits of size, the Newgrit laps are replaced in a few minutes by new laps correct to size and ready for use. Newgrit laps are turned to correct diameter in the factory on a special chuck. The Newgrit abrasive is said to have all the advantages of a lapping medium as well as the stock-removing qualities of hones.

Buckeye Automatic Screwdriver

What is claimed to be a novelty in small tool construction is the automatic screwdriver being introduced by The Buckeye Portable Tool Co., Dayton, Ohio, and shown in the illustration. The tool is air operated, and is built on the rotor principle. It is unusually small and compact, as well as light in weight. Its diminished size, however, is claimed not to detract from its driving power, and it is capable of driving a No. 15 screw 3½ in. long into yellow pine filled with pitch without previous tap hole drilling.

The tool has a number of improved



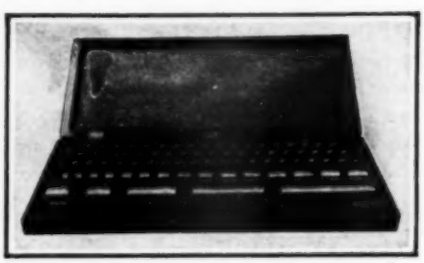
Buckeye Automatic Screwdriver

features, one of which is its ball bearing construction. Another feature is the absence of valves in the tool itself, and a button throttle control, which makes it easy to operate. The rotor construction is designed to eliminate vibration, and the four blades of the rotor are the only wearing parts. The gears are of heat-treated chrome nickel steel. The pistol-type handle is made to fit the hand. The largest diameter of the tool is 3⅝ in., the length of the main body is 6 in., length over all is 10 in., and the weight is 5⅜ lb. It is furnished complete with a quick-change chuck. Besides screw driving, the tool is also used for the setting of nuts, cap and set screws.

Van Keuren Set M-81 Micrograges

A set of micrograges for shop-working gage blocks was recently placed on the market by the Van Keuren Co., 12 Copeland St., Watertown, Mass. The set contains 81 gages and includes sizes of blocks from 0.050 to 4 in. The set makes possible any combination in ten thousandths of an inch from 0.200 up to the range of the set.

It is claimed that these micrograges are the only ones made with a wear allowance. These gages are held within a tolerance of plus zero to plus 25 millionths of an inch, leaving

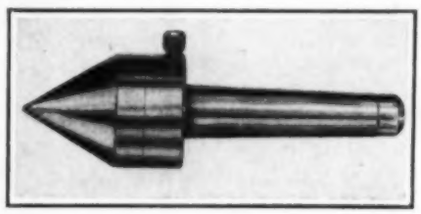


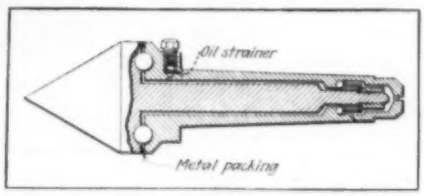
Van Keuren Set M-81 Micrograges

an average wear allowance of about 15 millionths of an inch. For this reason these gages are especially adapted for use on production work, particularly around grinding machines where wear is likely to make the gage block prematurely undersize.

Snellex Heavy-Duty Lathe Center

A front ball bearing of larger size than usual is the principal feature of the heavy-duty lathe center, which has been added to the line of such devices made by the Snellex Manufacturing Co., Rochester, N. Y. The center is designed to make it possible





Snellex Heavy-Duty Lathe Center

to turn out work at a greater speed without burning the center point. In the ball bearing the races are cut deep so that the balls conform almost completely with the grooves to assure ample load-carrying capacity for both radial and thrust loads.

Another feature of the center is the metal packing, which closes up the space between the rotating centerpoint and the tapered sleeve. This packing is lapped in to prevent chips and dirt from entering the ball bearings. An oil strainer is placed on the bottom of the oil hole to strain the oil from solids which may enter through the oil cap. The tapered shank is hardened and ground for greater strength and better fitting while the ball bearings are lapped to alignment with each other for accuracy and reduction of friction.

These centers can be made with any taper shank and with any kind of point to suit the requirements for turning, grinding, woodturning, milling and spinning.

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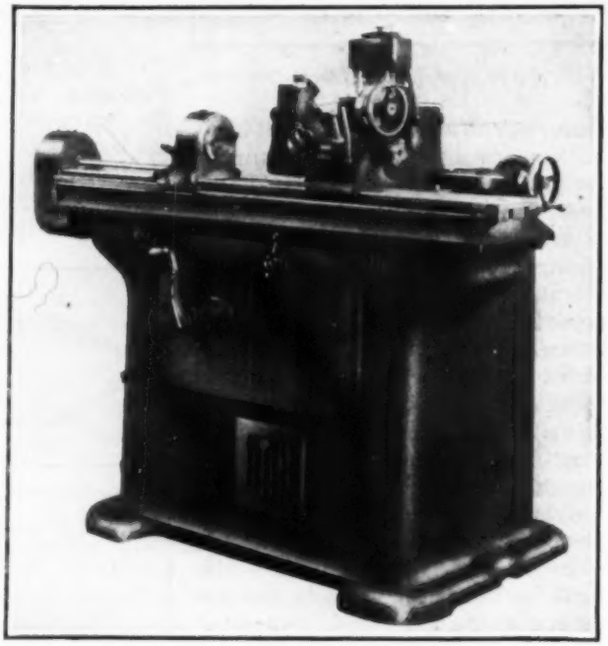
Barber-Colman Reamer Sharpener

THE Barber-Colman Co., Rockford, Ill., is marketing a reamer sharpening machine which is claimed to overcome the common difficulties met with in sharpening reamers, and will assure the desired finish and degree of accuracy without need of hand work on the reamers. The Barber-Colman system, controlling the reamer size, combines the reamers and a sharpening machine. The reamers are designed to be in step with the machine during the process of sharpening, and one cannot be used without the other. It is claimed that an exhaustive study has resulted in the accumulation of reliable data covering the amount of diameter cutting clearance, the form of the nose, and other points most suitable for cutting different materials with various degrees of hardness, and with this information at hand it has been found possible to furnish reamers best suited for the particular work. The requirements particularly considered in the sharpening of a reamer are the diameter cutting clearance immediately back of the flute, and a secondary or relief clearance. In addition to these, there is a lead-up or taper at the nose of the reamer, a drop-off or chamfer ahead of this tapered section, and in many cases a relief or back taper behind the point where the actual reaming is done. With the machine illustrated, all these dimensions are said to be not only held to the closest limits, but the entire job of sharpening is completed under positive mechanical control which is almost fully automatic. Close accuracy can, therefore, be maintained consistently.

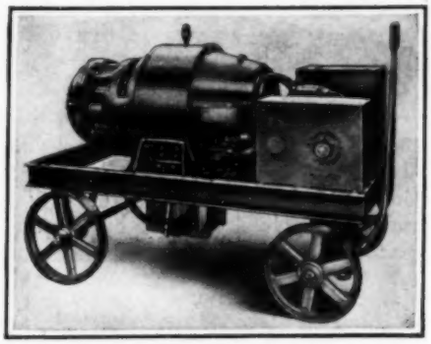


Barber-Colman Reamer Sharpener

Westinghouse Single-Operator Arc Welder

SIMPLICITY of operation is claimed to be the feature of the single-operator arc welder illustrated, which is being placed on the market by the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. The motor of the motor-generator set is controlled by a magnetic line-starter, consisting of three magnetic contactors operated by a push-button switch. The welding current is controlled by a single resistor in the direct-current generator field. The welder is built in three ratings: 200, 300, and 400 amperes.

The current range of the 300-ampere welder is from 75 to 400 amperes, in steps of approximately 7 amperes. The current range of the 400-ampere outfit is from 100 to 500 amperes. The squirrel-cage motor used to drive the machine is wound for 220 and 440 volts. For operating the welders, only two movements are necessary, namely, pushing a button to start the motor generator set, and turning the handle of one rheostat to adjust the welding current. The sets are built either as stationary or portable units.

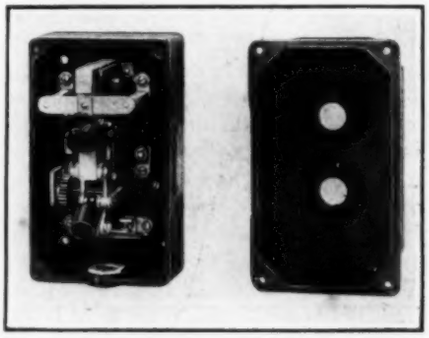


Westinghouse Single-Operator Arc Welder

Due to the constant current characteristics of the generator, the arc is stable over a wide range of welding current. The constant current characteristic assures deep penetration of the arc and complete fusion of the material being welded. It is also claimed that the generator is designed for quick voltage response to wide variations in the length of arc.

General Electric Time-Delay Push-Button Station

In order to prevent the cutting out of motors controlled by a magnetic starter when there is only a brief power disturbance, the General Electric Co., Schenectady, N. Y., developed the time-delay push-button station, an exposed view of which is shown in the accompanying photograph. The station is for use with standard magnetic starters, and it is not necessary to add time delay attachments to the starters themselves. When power fails, the magnetic starter will drop out, but will close again upon the return of the voltage by the push-button device unless the time for which the push-button



Interior of General Electric Time-Delay Push-Button Station

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station is set is exceeded. In that case the start button must be pushed to energize the magnetic starter, and so restart the motor.

In operation the depression of the start button closes the pilot circuit of the magnetic starter and also the circuit of a coil in the push-button station. This causes a solenoid plunger to rise, thereby closing spring attached contacts at the bottom of the plunger. When the voltage drops sufficiently to permit the solenoid to release the plunger the latter starts to fall but is retarded in its downward movement by a rack geared to a pendulum. The device can be adjusted to a maximum of 1½ seconds. If the power does not return before the time expires, then the contacts will be open and both the solenoid and the magnetic starter will be disconnected until the start button is again pushed. Pressing the stop button stops the motor immediately, as the plunger falls instantly.

Applications of Madison-Kipp Automatic Oiler

In Fig. 1 is shown the application of an automatic oiler made by the Madison-Kipp Corporation, Madison, Wis., to the National Acme Model C automatic lathe. The lubricator has been made an integral part of the motor base. It does not use the conventional separate tank. In this machine the lubricator mechanism is placed on the side instead of in the base of the machine and is driven off a rotating spindle so that it operates automatically with the machine.

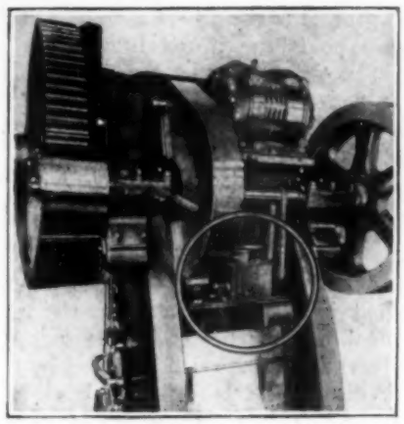


Fig. 2—Madison-Kipp Oiler applied to a punch press

In Fig. 2 the lubricator is shown applied to a punch press in order to obviate hand oiling which is a slow process and subject to neglect. The automatic lubricator is said to save a considerable percentage of the production time of the machine.

Carborundum Improved Internal Grinding Wheel

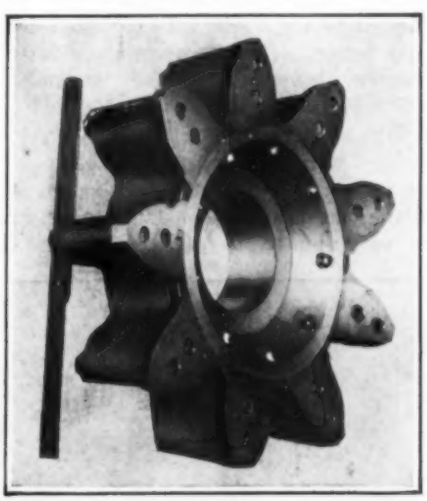
Concentricity of the arbor hole with the grinding face is claimed to be positively assured in the improved line of internal grinding wheels developed by the Carborundum Co., Niagara Falls, N. Y. The arbor hole itself is formed within very close limits of accuracy, so that the operator can obtain a proper fit on the spindle. The wheels are uniform in both diameter and thickness.

The abrasive structure is such that a free, clean, fast cutting wheel that holds its edges and produces true holes without bell mouth is claimed. Proper grits and grades for various classes of internal work are available. The wheel is particularly developed for use on automatic and semi-automatic machines of recent design.

Farrel Large Size Gear Cutters

In order to obviate the difficulty of producing a completely hardened steel cutter of large size, the Farrel Foundry & Machine Co., Buffalo, N. Y., has developed a line of built-up cutters. The one shown in the illustration is a pinion-type gear cutter, and is typical of the construction used. The bodies are made of cast or forged steel and high-speed steel blades are securely held in position by wedges and bolts. The cutting blades are roughed out to approximate tooth shape, are hardened, and are finish ground in position on the body so that they are as accurate as a cutter made from one piece of tool steel.

The following advantages are claimed for this type of cutter: The high-speed steel blades are small and therefore easy to harden evenly; if one or more teeth are injured due to local hard spots in the material being cut, it is a simple matter to replace them with new blades; the tool is economical because the body and holding



Farrel Inserted Tooth Large Size Gear Cutter

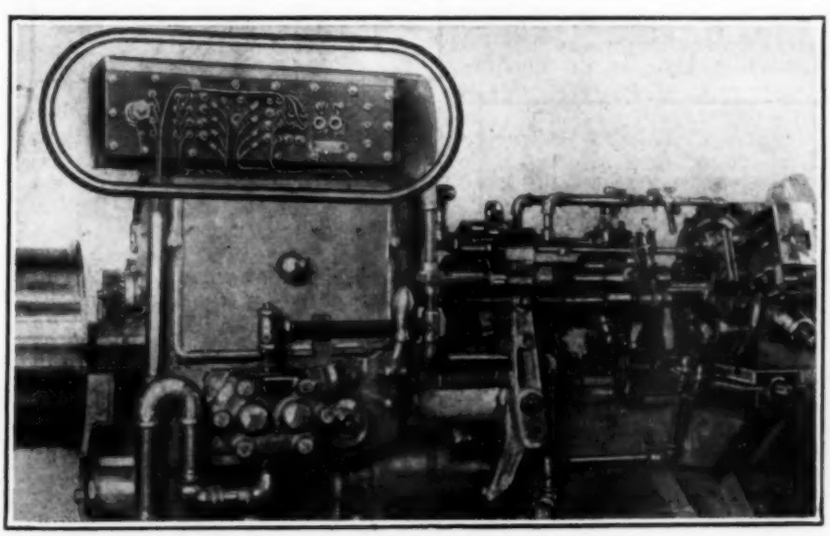


Fig. 1—Madison-Kipp Oiler applied to National Acme Model C Automatic Lathe

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device are permanent, and the cutting blades can be machined in large quantities; accuracy is assured because of the manner of finishing the blades in position; the operator can force the tool to the limit without fear of spoiling an expensive tool.

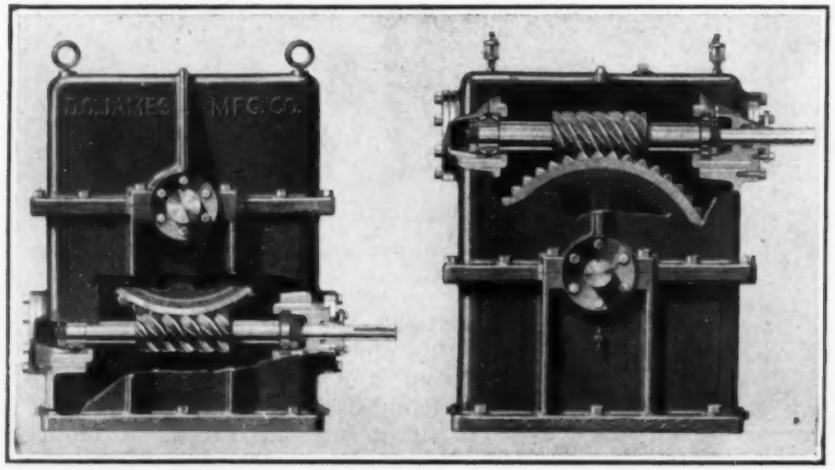
All cutters with teeth from 1¾ DP upwards are of this type.

James Heavy-Duty Worm Gear Speed Reducer

In order to assure smooth action the worms and gears are run in on a special relieving machine in the heavy-duty worm gear speed reducer made by the D. O. James Manufacturing Co., 1114 W. Monroe St., Chicago, Ill. The unit has been particularly designed to meet severe conditions.

A large oil-cooling chamber prevents overheating, and the housings are made of high-grade cast iron designed for maximum oil-cooling space and braced on the outside for strength. When the worm is at the top of the unit, sight-feed oil cups are used for furnishing oil to the roller bearings on the worm shafts while an oil level cock, fitted into the side of the housing, prevents overoiling. To facilitate cleaning and draining an oil plug is provided in the lower part of the housing.

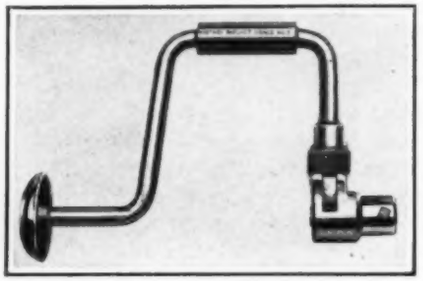
All parts are made with an ample safety factor. The gears are made of phosphor bronze and the worms of S.A.E. 3140 chrome-nickel steel. Timken and Norma Hoffman roller bearings with interchangeable bushings are used to carry both the worm and the wheel. Gear shafts are oversize and are made of 0.40-carbon steel, ground to size. A locknut with lockpin holds the thrust bearing in proper position on the worm shaft, while a stuffing gland prevents oil leakage. This gland can be repacked without disturbing the shaft.



James Heavy-Duty Worm Gear Speed Reducer

Whitney Heavy-Duty Ratchet Brace

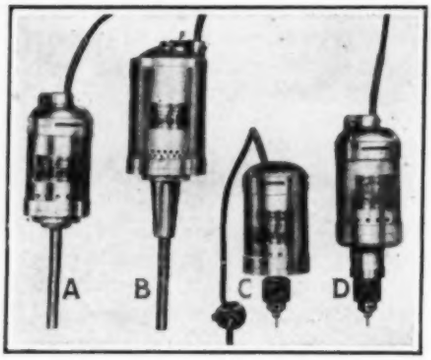
What is said to be a light, rigid ratchet brace for heavy-duty service was recently placed on the market by the Whitney Metal Tool Co., Rockford, Ill. The frame is made of seamless tubing in order to reduce the weight. The ratchet dogs and ratchet heads are made of hardened alloy steel and the ratchet head housing is welded to the tubing to make it secure. The breast plate and handle grip are ball bearing mounted.



Whitney Heavy-Duty Ratchet Brace

Clark Portable Electric Tools

Several additions have been made to the line of portable electric tools made by the Jas. Clark, Jr., Electric Co., Louisville, Ky. In the illustration tools *A* and *B* are die grinders and polishing tools. Tool *A* is for very light work, while tool *B* is for somewhat heavier work. These tools are said to be well adapted not only for surface grinding but also for internal grinding, the size of wheel depending upon the nature of the work. It can be seen in the illustration that these tools are primarily hand tools, but occasionally they can be clamped in a small bench stand or mounted on the carriage of a lathe or planer and used for internal grinding.



Clark Portable Electric Tools

Tools *C* and *D* are high-speed drills, particularly designed for drilling in wood. Tool *C* is for use with very small bits and has a high rotating speed, while tool *D* is for large bits and has a single gear reduction. For tool *C* the switch is located in the cord in order to reduce the overall dimensions of the drill, while in tool *D* the switch is conveniently located in the head.

Trade Catalogs

PUNCHES AND DIES. Richard Brothers, 1560-1574 Milwaukee Ave., East, Detroit, Mich., has just issued a 24-page 9x12-in. catalog, describing the standardized interchangeable punches and dies made by the company. Each type of die is illustrated with both half-tones and line drawings, and tables of specifications are given for ordering the punches and dies.

SMALL TOOLS AND MACHINERY. In order to meet the call for a complete descriptive catalog in convenient form, Joseph T. Ryerson & Son, Inc., Chicago, Ill., has just issued an 8½x4¼-in. catalog. The book contains 272 pages, cloth bound, with half-tone cuts of each type of tool and machine described. By the use of small type, an unusually large number of tools and machines are described in the catalog.

NEWS OF THE WEEK

Dr. Klein Sees Europe Shaking Off "Calamity Complex" of War Period

Notes absence of bitterness toward U. S.

EUROPEAN business on the whole has for some time been showing convincing evidence of recovery. Not the least important improvement has been the gradual disappearance of the mental hazard—the shaking off of a "calamity complex" and the gradual strengthening of business morale. An encouraging spirit of determination is spreading in commercial and industrial circles, which previously had been laboring under a cloud of despair. There is a growing conviction that the problem is one of trade dislocation rather than downright destruction. Furthermore, it is fully realized that the pursuit of the phantom of "prewar normalcy" is not only inexpedient but futile, that a new economic world has come into being since 1918 and the task involves not "restoration" of antiquated conditions but adjustment to a new and vastly improved business environment. This is the gist of a report issued by Dr. Julius Klein, director of the Bureau of Foreign and Domestic Commerce, after an extensive study of European economic conditions.

"Particularly encouraging has been the completion of currency and budgetary stabilization in practically all countries," says Dr. Klein. Another financial indicator of importance has been the steady advance of savings. Their total in Germany, for instance, on July 1, 1927, exceeded 3,718,000,000 marks, as compared with 2,154,000,000 in June 1926—a formidable increase of nearly 80 per cent.

Exploit New Lands

"An economic phenomenon is evident which has appeared after every war in modern times, namely the intensive exploitation of the resources of colonies, dominions, and other economically 'new' lands as a solution for unemployment, and in general to redress the havoc of warfare in the mother countries. The reactions of this movement upon American trade have already set in: first, in the stimulation of buying power in the new lands, many of which require just the type of mining machinery, farm equipment, road building apparatus, etc., which was used in opening up our own country. Secondly, however, there is evident a perfectly natural endeavor to conserve the benefits of this new development primarily for the parties immediately involved, especially through preferential tariffs, to which we can take no exception unless there be evidence of discrimination."

The report further states that the industrial situation in the Old World has still many unfavorable spots in some districts or industries, but on the whole the recovery in recent months has been decidedly gratifying. Unemployment figures have been dwindling steadily; in the United Kingdom the decline during the past twelve months has been from about 1,600,000 down to 1,000,000. In Germany recovery has been even more spectacular, the number of unemployed having fallen from 1,700,000 in June, 1926, to 541,000 in June, 1927. The decline in France during recent months has been at the rate of 2,000 a week. Industrial production generally has risen steadily. Steel exports of Europe for 1927 will show for the first time a substantial gain—probably about 20 per cent in volume over 1913.

Greater Buying

All of this betterment will undoubtedly mean improved buying power on the part not only of our leading customer (Europe took 48 per cent of our exports in the last twelve months) but also in the oversea European dominions and other sources of her foods, raw materials, etc. Nevertheless, the possible implications in this recovery in terms of more intensive competition should not be overlooked by American industry.

It must not be inferred, of course, that there is no room for further improvement in the European economic situation. Business leaders throughout the old world complain that trade barriers are still retarding commercial development all over the Continent. They point out, for example, that over eight thousand miles of new frontiers were set up in Europe by the Treaty of Versailles and several of these, as well as the older ones, have been decorated with strands of barbed wire in the shape of cumbersome customs procedure, multiplicity of tariff classifications, and in general an all too widely prevalent excessive economic nationalism.

"It is gratifying to note in European business circles practically complete absence of any bitterness or hostility toward the United States," concludes Dr. Klein. "There is, in fact, on the contrary a steadily increasing appreciation of the need for mutual trans-Atlantic good-will for the facilitation of capital advances and the steady increase of merchandise movements, which have been growing regularly in both directions. The value of American loans has been all too keenly appreciated to permit of any serious interference through impulsive, superficial hostility. Since 1924 over 800 million dollars have been advanced to Germany, which has been responsible for at least a substantial portion of the industrial and commercial recovery of that country, with consequent helpful reactions to its neighbors."

Standards Committee Reports Progress

The *Year Book* of the American Engineering Standards Committee, which has just been issued, indicates that an extremely wide range of work is being covered by approximately 2,000 individuals who are serving on sectional committees as the accredited representatives of over 300 national co-operating bodies.

There have been sixty-one mechanical projects inaugurated, and of these nineteen have already been approved. Substantial progress has been made in the work on both nuts and rivets. One continental part has been completed and published, that on wrench head bolts and nuts. Other parts including slotted head machine screws and wood screw heads, track bolts and carriage bolts are well advanced.

Most of the work on the nine sections of the project of pipe flanges and fittings is nearly completed, and it is expected that several of these will be ready for publication in the very near future. The section dealing with high pressure fitting and flanges, has been completed and issued.

The first section of the work on machine tool elements, that dealing with T-slots, has been completed, as has the first section of the work on gears. This section deals with the tooth form of spur gears. A specialized but important piece of work completed is that of shafting gears, both plain paper and gib heads.

World Power Conference

The next World Power Conference will be held in Germany in 1930. A definite decision to that effect was reached last week by the International Executive Committee meeting in Cernobbia, Italy. It also is decided to hold a sectional meeting in Tokio in 1929.

Tentative arrangements had been made to hold the next conference in Italy, but the Italian committee explained that the conference could be held more profitably in Italy at a later date when its hydroelectric program will have developed somewhat further.

Germany Counts Results from Adoption of "Rationalization" in Industry

Price level of manufactured goods lowered

By Our Berlin Correspondent

IT IS now several years since German industry started the efficiency and economy movement called "rationalisierung," and since the beginning of the current year its fruits are beginning to show.

This at least is the opinion of economists, while manufacturers themselves frequently entertain other views with regard to the clearly visible improvement of business. Among such views is found the theory that the British coal strike is responsible for this improvement, setting afloat as it did the basic industries and through them the whole of German business. No doubt these views confuse immediate cause and originating force. All the British coal stoppage did for German industry was to accelerate its upward movement. The actual gains, which the German coal and steel industry made were not large enough, considering the total of Germany's export.

Other reasons given for the ascent of business are the increased purchasing power of the population in combination with the stationary cost of living, inflated somewhat by an extension of credit; and the unbroken run of stable conditions, which has raised confidence in the future.

These factors alone would not have been sufficient, if it had not been for the lowering of the price level of manufactured goods. The latter is to a large extent the result of rationalisierung.

A New Word

This word, which is not to be found in any dictionary, being of rather recent origin, covers a complex problem. It does not mean scientific management, with which it is frequently identified in foreign papers. It might be interpreted as a commandment for greater efficiency and economy, leaving it to individual efforts and ideas to achieve these ends. It comprises not only shop efficiency and economy but the manufacturing process in all stages and ramifications including the sales and distribution end of it.

Rationalisierung took its origin in the realization of the fact, arrived at shortly after the Mark stabilization. that there was something fundamentally wrong with the cost problem in German industry. Most pronounced was this fast in the motor car industry, which explains why this industry started the movement and has since then been leading it. America was looked to for an explanation of the German problem, and for this reason the first steps followed American lines. These efforts experienced a severe check. It was found impossible and impracticable to transplant American methods to German soil, for two chief reasons—the lack of a broad enough domestic market, and the opposition of the German workmen against such methods.

German managers must proceed very carefully if they want to introduce the American speeding up process into their works. It will come in time, no doubt; attempts are being made everywhere with this process, for which in Germany the word "Fliessarbeit" has been coined, but the results are as yet inconspicuous.

More effective have been the endeavors to ascertain and then eliminate waste of time and to reduce unproductive labor to the utmost limits. A great task was to reduce unnecessary friction in the wheels of the industrial machinery. The spirit of independence, which prompts manufacturers to leave as little as possible to supply from outside, is yet unbroken. The result is that existing machinery is not fully employed, which of course reacts upon the installation of new specialized machinery; and the shops generally are overstocked with workmen. The manufacturing problem was, and still is, not to keep the machines but the workmen busy.

The rationalizing movement has vigorously attacked this spirit, backed by the excellent work of the German Standardisation Committee. The progress is methodical and slow; so strong is that spirit, however, that its defeat finds frequently expression not in jobbing contracts from work to work but in combines and assimilation.

An important part of rationalisierung is the sales and financial side of the problem. Salesmanship, neglected for 10 years, has improved and method has replaced the hap-hazard ways of a few years ago. Banking arrangements have made credit easier and loans cheaper.

A few years ago it was doubted by the leaders of German economic affairs whether Germany could continue as an industrial country, even only on the pre-war scale, but now she is determined to obtain industrial leadership, at least in Europe.

Penn. R. R. Places Large Order for Rails

The Pennsylvania Railroad Co.'s improvement program for 1928 calls for the purchase of 300,000 tons of steel rails, it was announced on Sept. 14, at which time the board of directors authorized the purchase.

This is the largest rail-purchasing program the company has ever outlined, and represents an increase of 50,000 tons above what the company will have used in the twelve months of the present year. The financial outlay was not made known, but on the basis of figures quoted by steel company offices in Philadelphia it will be in the neighborhood of $14,000,000, it was expected. The new rail will be used to continue the program of renewals and betterments, much of which involves the substitution of heavier rail for that now in the track, as well as additional double-tracking and new track construction.

The extent of the Pennsylvania Railroad's annual rail purchases in the past is indicated by the following compilation of the rail orders for the last ten years:

Year	Tonnage Ordered
1919	38,000
1920	119,500
1921	200,000
1922	86,000
1923	138,000
1924	194,000
1925	120,000
1926	200,000
1927	250,000
1928	300,000

Guggenheim Committee Will Study Meteorology

Harry F. Guggenheim, president of the Daniel Guggenheim Fund for the Promotion of Aeronautics, announces that in order to advance the art and science of meteorology in aviation, the "Daniel Guggenheim Committee on Aeronautical Meteorology" has been formed by representatives of the Guggenheim fund and of the appropriate governmental institutions interested in this work.

The committee, whose headquarters will be in care of the Weather Bureau in Washington, is composed of C. G. Rossby, representing the fund; Willis R. Gregg of the Weather Bureau; Major William R. Blair of the United States Army; Lieutenant F. W. Reichelderfer of the United States Navy; and Thomas H. Chapman of the Department of Commerce.

The committee itself will not take up research work to any great extent, but will be in a position to encourage and support investigation by suitable persons or institutions and to direct attention to essential problems.

It Pays to Advertise

In connection with the $1,000,000 national advertising campaign the industrial bureau of the Atlanta Chamber of Commerce is now conducting to attract new industries to the Atlanta and adjacent community, an instructive booklet has been published by the bureau, completely describing the campaign and the results it has so far achieved. A fitting tribute to the value of the industrial trade press as an advertising medium is paid, for it is stated that within the past year nearly 200 new concerns have located in Atlanta, many coming as a direct result of this advertising. Trade papers reaching industrial executives comprise the principal medium being used. Readers of *American Machinist* may obtain a copy of the booklet by addressing the Atlanta Chamber of Commerce.

First Power Show in Canada a Success

Canada's first Steel and Power Show, staged at Varsity Arena, Toronto, Aug. 31, Sept. 1 and 2, proved a phenomenal success. It is estimated that over 7,000 men in the power and mechanical engineering fields visited the arena during the three days to examine the booths showing $500,000 worth of the products of 300 manufacturers, and to hear the twenty-one speakers at the technical sessions.

The outstanding feature of the show was the character of the attendance. Admission was by invitation. The attendance was thoroughly representative of Ontario and Quebec, and included a considerable number of executives and others from other provinces, the United States, England, and even Austria.

On Aug. 31, Robert W. Angus, professor of mechanical engineering at the University of Toronto, declared the show officially opened, following which Dr. F. C. Langenberg, research engineer, U. S. Army, Watertown Arsenal, gave the first address on "Where Are We Going in Metallurgy?"

Luncheons were held at the King Edward Hotel during the show, the principal speakers being B. Stuart McKenzie, Ottawa, secretary of the Canadian Engineering Standards Association, on "What Standardization Can Do For Industry"; and R. B. Morley, Toronto, general manager of the Industrial Accident Prevention Associations of Ontario, on "Accident Prevention Profitable to Industry."

Wednesday's speakers, in addition to Dr. Langenberg, included F. A. Combe, Montreal; L. T. Rutledge, associate professor, mechanical engineering, Queen's University, Kingston; M. Barry Watson, director of engineering, Central Technical School, Toronto; F. S. Collings, mechanical engineer, Sargent & Lundy, Inc., Chicago; Frank L. Eidmann, associate professor of machine design, school of engineering, Princeton University; and Robert W. Angus, professor of mechanical engineering, University of Toronto.

At a welding session on Thursday the speakers were J. F. Lincoln, Lincoln Electric Co., Cleveland; S. W. Miller, president, Union Carbide and Carbon Research Laboratories, New York; Joseph Cave, vice-chairman, Canadian Section, American Welding Society, and welding adviser, Davenport Works, Canadian General Electric Co., Toronto; and T. Holland Nelson, T. H. Nelson & Co., Conshohocken, Pa.

In the evening C. A. Thinn, research engineer, C. A. Dunham Co., Chicago; J. O. Twinberrow, designing engineer, Babcox-Wilcox & Goldie-McCulloch Ltd., Galt; and A. N. Otis, industrial heating engineer, General Electric Co., Schenectady, N. Y., were the speakers.

Melvern F. Thomas, Toronto consulting engineer, spoke on Friday morning, and was followed in the afternoon by O. W. Ellis, research metallurgical engineer, Westinghouse Electric and Manufacturing Co., East Pittsburgh; L. M. Arkley, professor of mechanical engineering, Queen's University, and M. P. Whelen, industrial heating engineer, Toronto Hydro-Electric System.

The speakers at the final session on Friday were W. S. Quigley, president, Quigley Co. of Canada; E. A. Allcut, associate professor, mechanical engineering, University of Toronto; and John Howe Hall, research engineer, Taylor-Wharton Co., High Bridge, N. J.

The show included many working exhibits of steel-treating furnaces, machine tools, pneumatic tools, pumps, blowers, fans, etc. Equipment was shown, in many cases, under actual operating conditions.

The number of exhibitors and non-exhibitors who signed agreements for the 1928 show (Sept. 4-7, 1928), left no doubt as to the complete success of Canada's first steel and power show.

Aeronautical Exposition Coming to New York

Plans for the American Aeronautical Exposition, to be held in New York City Oct. 20 to Nov. 6, have been announced by the committee of arrangements, of which Maj. Gen. John F. O'Ryan is chairman.

The exposition is to be held in the 258th Field Artillery Armory. The main floor space is 300 x 600 ft., or a total of 180,000 sq.ft. In addition, there are a number of rooms on the same floor.

Under the plans adopted by the committee it was decided that the exposition shall show a complete history of the science that has made flying possible in addition to giving a thorough exhibit of the present achievements and a glimpse into the future. As many as can be secured of the historic airplanes will be shown and these will be arranged so that the development of aviation may be understood by all.

The most modern of the present-day "ships," will have places of prominence. Airplanes for passenger carrying, for transporting the U. S. mails, for bombing, for photographic work, for air fighting and all other types will be used to educate the public to their varied purposes.

Aviation accessories will occupy a large section of the main floor. These will range from oil and gas exhibits to the scientific instruments so vital to successful flight. Radio and the other effective means of airplane communication will all be shown.

The motor division has promised to be one of the most important as well as most interesting to the general public. Motors that have made history will be shown as well as the more modern developments in that field.

Arrangements are under way to secure certain exhibits from abroad. England, France, Germany and Italy all have aeronautic equipment of importance to the fliers and of interest to the general public of this country.

The committee has established headquarters at 17 East 45th St., New York. Vincent E. Scott is general director.

Army-Navy Aeronautical Standards Conference

The fourth annual Army-Navy aeronautical standardization conference was convened at Wright Field, Dayton, Ohio, under the auspices of the Army Air Corps, during the week of Sept. 6. Representatives of the Army Air Corps, the Bureau of Aeronautics of the Navy Department, the Naval Aircraft Factory, the National Advisory Committee for Aeronautics, the Department of Commerce, the Forest Products Laboratory, and other government branches met with those of all the principal aircraft manufacturers and parts and material suppliers, to make a total personnel of 75 who attended the various subcommittee meetings.

The sub-conferences were divided into the following groups: (a) Power plant; (b) airplane structures; (c) airplane general design, utilities and parts; (d) propellers; (e) armament; (f) equipment; (g) materials. Each of these subcommittees were in practically continuous sessions, except where combining them proved advisable for certain subjects, and the decisions rendered should prove of great value to the Government and to private manufacturers of aircraft and the suppliers of parts and materials.

The vast field covered makes it impossible to render a detailed account of all the decisions. Outstanding in the power plant group were agreements on design, details for pumps, strainers, valves, pipe line fittings, engine control units, etc. The engine manufacturers will undertake to apply the existing and structural standards for bolts, nuts, pins, cotters, etc., to their products, which should result in a considerable economy. Detailed studies on the part of engine manufacturers will be undertaken to make the existing engines of a given type and horsepower interchangeable, so that a power plant installation may be changed from one engine to another with a minimum of effort. In fact, the many agreements reached will do much toward simplifying engine installations in the future.

In the general field much is to be gained in the decision to adhere to the Class III Medium Fit of the National Screw Thread Commission for all threaded parts, thus doing away with the necessity for selective fits for these parts. The services will supply their inspectors with gages to readily carry out this decision. Many detail specifications for materials were brought into agreement both between the services and commercial practices. Many of the structural requirements for design were considered, and the few remaining differences existing after previous conferences, eliminated.

The co-operation and good will evinced by private industry in sending competent representatives to present the commercial aspects of the subjects, materials and parts under consideration, played the major part in the success of the conference. The details will be published by the Government Service.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

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A NEW philosophy of business is finding many adherents in the United States. Sir Thomas More might have been its author, for it is almost Utopian in its character. Briefly it assumes that we are in a new era in which adversity will be unknown because our economic machinery has been so perfected that it will adjust itself to change while running at high speed.

It is claimed that the increased use of labor-saving machines has greatly accelerated the creation of wealth and that high wages have immensely increased the spending power of the people. That in hydro-electric energy we are provided with an inexhaustible supply of cheap power, and that through the improvement of our transportation system goods can now be so promptly moved that large stocks are unnecessary. That a scarcity of credit has been made impossible by the establishment of the Federal Reserve Banks and that as we are insured against a money panic, there is no reason why our immense resources should not be transmuted into capital at a constantly increasing rate of speed.

It is argued that this capital must be invested. Hence the increased bank deposits, the eager demand for stocks and bonds, and the ease with which anything that will pay an income can be sold.

The only flaw in this theory is the humanity of human nature. If what is called the machinery of business was in fact an inanimate machine with wheels and cogs and levers, it might be so geared that it would yield a constant output as long as the power required for its operation was applied.

In his play, "Rossom's Universal Robots," Karel Kapek attempted to depict such a mechanism. Its units were machine-made-men without souls or emotions. They did the world's work automatically and when they were worn out they were scrapped and made over. They were 100 per cent efficient until a real human being who came among them found a way to give them a consciousness of pain and pleasure and to invest them with a capacity for passion, pride and prejudice. Then the machine of which they were parts ceased to function and society reverted to the imperfect system under which it had formerly lived.

So it is apt to be with the theory that assumes an indefinite continuance of our present prosperity. Sooner or later the human factor will appear as a monkey wrench among the gears that are now moving so smoothly. Then it will be necessary to slow down. No one can say just when that necessity will arise, but it is hard to believe that the present rate of speed can be maintained much longer.

In last week's market, several high-class and high-priced stocks advanced as much as 5 to 10 per cent in a day. Until recently such fluctuations would have been regarded as danger signals, but they are hardly remarked upon now. They cannot yet be regarded as significant of increased earnings, for corporate profits are not increasing, and President Storey of the Atchison, Topeka & Santa Fe R.R. says that it is not to be expected that the income of the railways will exceed 1926.

Meantime the grain markets have continued to decline and both wheat and corn are 25 cents per bushel below the summer's high. The Agricultural Department has discovered that there has been an improvement in the corn crop, and the yield of wheat in Canada will be the second largest on record.

The hysteria into which the cotton market was thrown by the last government estimate is also abating. The weather in the South has become more favorable and it is becoming plain that there can be no cotton famine even though the crop should not exceed 12,500,000 bales. This view is confirmed by a statement from the Department of Agriculture issued last Thursday.

In the other speculative markets the price changes have not been important. Sugar has recovered the slight decline registered last week. A further advance would seem to be indicated by the growing strength of the statistical position. Coffee is well supported by the Brazilian government, but South American stocks are accumulating rapidly and consumers seem content to buy only for bare requirements. Rubber has been held steady by the American consumers' pool.

The demand for steel is still subnormal although some large orders from the railroads are reported.

In the foreign news there is not much that has any direct bearing upon American business. The proposed advance in French import duties is exciting the ire of our protectionists, while the free traders seem to find great amusement in the protests that our government is making against the high tariff that France would attempt to impose.

But these details are more interesting than informing. What business men want to know is—"Are we warranted in expecting good times this winter?" To this question an affirmative reply seems justified, provided the sky-rocketing in the stock market is brought to an end before it does serious harm.

WHAT'S DOING IN INDUSTRY

THE BAROMETRIC trend of the machinery and machine tool business took a sharp turn upward in the past ten days. From practically every large industrial center comes the report of increase sales and more active inquiry. The monthly index figure for machine tool orders, issued by the National Machine Tool Builders' Association, shows a decided upward trend. The figure for August stands at 166, using the average for 1922-23-24 as a base figure of 100.

NEW YORK dealers report an increase in both orders and inquiries, a few very substantial sales being recorded. The South shows slow but steady improvement, fostered by the continued betterment of crop conditions. Canada is in a similar position and much is looked for in new business during the fall months. New England business was stimulated by the recent exposition and automotive, railroad and special machinery buyers have been active.

CINCINNATI manufacturers are optimistic over the slight improvement of the past week, and the volume of current inquiries promises continued progress. Detroit reports a better feeling, with the larger automobile manufacturers beginning to take on new equipment. Increased sales to a wide variety of industrial users has stimulated business in Indianapolis. The improvement in general conditions in Chicago continues, but sales are still rather quiet.

GOOD TIMES are predicted in the business world this winter, provided the stock market can be kept from "sky-rocketing."

The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

NEW ENGLAND

Stimulated to a fairly considerable extent by the recent machinery exposition in New Haven, machinery building in the New England territory shows improvement this week and a better feeling prevails in the industry. The conclusion of the vacation season is an important factor in the situation.

The automotive industry has been well represented in the buying during the past ten days and much of this is judged to be business of replacement variety, although some is known to be for expansion. Railroads have been buying in the last fortnight. Special machinery business looms especially favorable at this time, with buying from Connecticut manufacturers for the glass-making and rubber and paper industries.

Manufacturers believe that the next month will witness steady improvement in business with conditions which can well be described as "good" prevailing.

NEW YORK

There has been a noticeable change for the better in the tone of machinery and machine tool business in this market. During the past ten days activity has increased to the extent that some dealers and agents predict that September will be the biggest month of the year in point of sales, and that the long expected boom is on its way. Some good sized orders were received last week, one in particular calling for 7 lathes, a planer, 2 radial drills and a milling machine.

Inquiries have increased notably. The variety of industries represented in the present demand would seem to indicate a widespread activity. Chemical plants, radio manufacturers, transmission manufacturers, steel fabricators, printing machinery manufacturers and the aircraft industry are among those asking for quotations. The latter industry is expected to buy much in the way of special machine equipment to be used during the winter when extensive plans will be made for spring flying activity.

The used tool market is running rather smoothly, since prices still prove an attraction to many classes of buyers.

CANADA

Recent predictions that the wheat crop of Canada this year would be the second largest in the Dominion, and that the entire grain crop in the West would establish a record for money value, has caused much rejoicing among machinery and machine tool manufacturers, who expect to enjoy a goodly share of the all-round increase in business which, it is anticipated, will follow.

Reports of industrial expansion on which estimates of future prosperity are based continue to appear. Willys-Overland, Toronto, announces that the firm will erect, at the Weston plant, a $200,000 addition, and spend $100,000 for additional equipment. The big Tudhope Carriage Works at Orillia, Ontario, has been disposed of to a Scottish syndicate, which will shortly commence operations. Reports from Toronto state that consumption in that district continues good, as compared with the general summer average. A considerable amount of business, especially in machine tools, was transacted at the Canadian National Exhibition, in Toronto, where the machinery exhibit was one of the outstanding features. The markets are fairly active, both in eastern and western Canada, but interest in fourth quarter requirements has not yet developed to any great extent.

CINCINNATI

Machine tool manufacturers in the Cincinnati district state that the market showed a slight improvement in the past week. Selling agents report that they made a slight gain and express the opinion that a livelier market is developing.

Orders for single tools and replacements continued to form the backbone of the market, but here and there there was an order for two or three tools. The greater part of the week's sales were to general machinists and miscellaneous users, located in all sections of the country, and their purchases were well diversified in the matters of sizes and types. There were a few scattered orders from railroads, and there were a few single orders from concerns in the automotive industry. Small export orders came from several countries, including Holland, Germany and South America.

Inquiries came in freely during the week, and while there were a few small lists submitted the great majority of the prospects asked for information in regard to single tools and replacements.

DETROIT

A slight improvement has been noted in the machinery and machine tool market during the past few days. While only a few orders have been received, and all of those have been for special equipment, there is a better feeling throughout the district. Dealers report a substantial increase in the number of inquiries and the general impression prevails that many of these inquiries will result in immediate buying.

Thus far the only buying that has been done has been by the automobile manufacturers, who are installing equipment for four-wheel brakes. Four of the large manufacturers are adding this feature to their cars.

It is generally felt here that the show at Cleveland will lend a strong impetus to buying throughout the country.

INDIANAPOLIS

Slight improvement can be seen in demand for machinery and machine tools during the past two weeks. Inquiries are being received from the automotive industry for tools. It is not thought any great volume will come from this source until cool weather, but it is apparent that inquiries mean business and the latter part of this month will see Indiana's automobile factories increasing production.

The demand from the farm implement factories in the state is looking better. Orders show a slight improvement and the volume of inquiries is increasing.

A fair demand for special coal mining machinery is being received. While most of the shaft mines of the state still are non-productive, one by one the individual owners are signing with the union and a rather steady volume of business is resulting as the shafts are put back into operation.

A better demand is seen in the railroad field. Part of this is due to the fact that roads operating in Indiana have more motive power at work, necessitating more shop work. The signs for fall in this field are good. Demand from the contracting field for special equipment is decreasing somewhat. The lumbering manufacturing centers are a bit slow, but a rather steady demand for machinery from the woodworking plants is being experienced.

CHICAGO

While the improved condition of the machine tool market recently noted has not shown any further tendency to increase sales, the market has been fairly well maintained, and most machinery men feel reasonably confident that before the month of September closes renewed activity in the machinery trade will be general. A great deal is expected in the way of stimulated buying from the Cleveland Machine Tool Exposition scheduled for next week. Practically every local executive and sales manager in the machinery industry who can be spared from his desk has expressed his intention to attend the exposition, which by many is counted on as a medium for making advantageous and profitable contacts.

At the present time the agricultural implement industry is doing most of the buying of machine tools, the International Harvester Co., the J. I. Case Threshing Machine Co., and the John Deere Co., having placed some good orders and indicated that more are to follow. The demand for used tools by general industry is light, but fairly steady. Railroad buying has practically ceased so far as old lists are concerned, such tools as are inquired for being mostly for replacement purposes.

SOUTHERN DISTRICT

Machine tool and equipment sales in the Southeast continue to show slow but steady improvement and are larger than they were during the latter part of the summer. Business has not picked up as rapidly as had been expected, and is only slightly larger than at this time last season. Inquiries, however, have increased in the past two or three weeks.

The principal reason the outlook is so good because of the exceptionally high prices prevailing for leading Southern crops, especially cotton, a fact which has eased the financial situation and greatly improved buying in a majority of lines.

Woodworking machinery sales are active, especially to furniture manufactures in the Southeast. Textile machinery is active, as several large new mills now are being constructed. Purchases by smaller machine shops are quiet, mainly in the used or rebuilt line, while sales to garages and service stations have been showing signs of improvement. Contractors' equipment is fairly good due to the large amount of new building going on, but road machinery sales have declined. Railroads continue active in the market for heavier machinery, and their inquiry gives promise this business will continue good. Farm equipment sales are larger than last season.

Commercial and Industrial Enterprise Not Making Progress in France

Buying public gives little thought to rationalization

By Our Paris Correspondent

IF GENERAL living costs in France have eased up a trifle, as shown by a fall in the index numbers of food stuffs, the same state of affairs by no means exists with regard to the product of commercial and industrial enterprises. High price levels and taxes on invested capital and its returns, to say nothing of turnover and general trading taxes, are affecting seriously both production and distribution.

Rationalization of French industries is advancing in inner circles in production and distribution lines, but the buying public gives little thought to anything but the quoted price, not understanding that only more rational production methods can be called upon to improve the price scale in its favor. Nevertheless, it is for this that transactions in many lines of metal manufacturers are considerably curtailed.

Metal Trades Uncertain

French metallurgical and the metal fabricating trades are in a very uncertain position. Some authorities refer to it as "chaotic." Apparently the producer realizes it, as he also recognizes his impotency to improve thing of his own free will. The competition of the moment is at least illogical.

According to quasi-official statistics, the French electrical supply trade which in 1913 imported 6.1 per cent of the world's foreign trade in electrical machinery and accessories, now absorbs but 3.5 per cent thereof. This would argue that French production has improved in volume appreciably, which is true; but the fact is again recorded that the per capita expenditure for electrical tools and appliances is but one sixth of the per capita expenditure of the United States. This again argues that the French market is not as generous as might be hoped for.

France has made considerable development in electrifying its railway lines, with proportionate increased demands for tools and machinery contingent thereto; but of the length of track transformed there is but 2 per cent of the total mileage, while in Italy the figure is 4.8 per cent, and in Switzerland 15 per cent.

A French critic complains that the French metal industries have followed old fashioned production methods too long and that the whole of the difficulty is thus brought about. He states that productive industry today is as much a matter of finance as it is of labor, machine or otherwise, and that old methods should be abolished. Complaint is made also that metal working specialists are becoming journeymen, first working in one establishment and then in another and not sticking to the old firm as formerly, with the result that many famous old firms are nothing but "a mass of ruins," while many of the newer firms are unstable, though offering the worker advantages which he did not have before. This sizing up of the situation is particularly applicable to the French automobile industry. It is probably equally applicable in similar trades.

The event of the last fortnight has been the signing of the Franco-German customs accord which is to endure for a year and which is to take date from September 6. It grants a new minimum tariff to German imports which includes especially "metallurgical products and machinery." Advantages are bi-lateral but it may be conceded that Germany will be able to make the most of the new regulations when it comes to manufactured products. In addition the agreement provides that in September, 1928, Germany, whether there is a new revised general tariff in France or not, will benefit from the "most favored nation" clause so common in customs treaties today. It may be noted that the first seven months of the present year showed a falling off of imports of materials necessary to industry (raw or semi-raw materials) to the value of two billion and a quarter francs, in volume a million and a quarter metric tons.

Needs Tool Steel

France is not yet sufficient unto itself for tool steel, as 281 metric tons were imported; while of special steels there were imported 1,136 metric tons, as against 395 tons exported during the first six months of the present year. Machine wire exports, however, reached 97,483 tons as compared with imports of 742 tons. This latter item is virtually double of the figure at which it stood in 1926 as to exports, while imports are but one fifth.

A government inspired note has stated that France produces but 2.4 per cent of the world's output of machinery while the wages paid French workmen in the industry are but 22 per cent of the wage scale of the United States when reduced to gold values. At the same time the living cost index of the French workman stands, as compared with 1913, at 525 in the Paris district, 708 at Lille, 492 at Lyons, and 620 at Rouen. The workers in the machine industry in the Loire valley find their index at 201, as compared with 100 in 1920. This shows plainly that not all of the rise in living costs dates back to before the war.

It is denied by the Comite des Forges that any international agreement has been arrived at with respect to plates and sheets for the automobile and boiler industries and that all such rumors are premature.

The Franco-Belgian tube consortium, which includes fourteen French plants, is selling 10,000 metric tons monthly, chiefly at export prices. Building hardware and material for electric transmission lines are finding some prospective business while there are some trifling orders being given out for rolling stock by the government railways. Cutlery and cutting tool makers are for the most part working but three days a week, though prices have been cut on all lines. The bicycle industry of Saint Etienne is duller than for months past. Bolt makers in the Nord Department report increasing business. Machine tools in general and the smaller units such as vises, hand drills, etc., are in a difficult position due to a lack of orders from retailers or distributors. Drills, taps and dies find themselves in a disastrous state by reason of heavy price cuts which have been made to induce business which is lacking from the static condition of the French automobile industry, which is about the largest current consumer of these lines.

The production of weighing instruments is in full activity with attendant prosperity. There is a tendency for a rise in prices in this line which makes this specialty a far more profitable manufacturing operation than that of many others. The agricultural machinery industry is dull except for the production of replacement parts. The same observation applies to the automobile industry.

Gear Manufacturers Join A.E.S.C.

The American Gear Manufacturers Association has become a member of the American Engineering Standards Committee, with direct representation on the main and executive committees. The American Gear Manufacturers Association was organized in 1917 and now contains 94 member companies. Since its organization it has been active in standardization work. It has today adopted 5 association standards and 33 recommended practices. George L. Markland, Jr., chairman of the board of the Philadelphia Gear Works, represents the association on the A.E.S.C., with S. L. Nicholson as alternate.

Welding Conference at Minnesota

Users of welding and cutting equipment in the Minneapolis territory are planning to attend a conference of the welding industry to be held at the University of Minnesota on Oct. 20, 21 and 22. Professor S. C. Shipley, acting head of the mechanical engineering department of the College of Engineering, is in charge of the program.

Representative engineers will present various papers from the users' point of view and following each paper there will be a round table discussion. The object of the conference is to standardize industrial practices and to develop new applications and techniques from the varied experiences of many welding experts.

Personals

J. DUFRESNE, chief engineer of the Citroen Works, of Paris, France, is attending the machine tool exposition at Cleveland.

J. B. PRICE has been appointed manager of the Detroit office of the Master Electric Co., of Dayton, Ohio. This office is located at 89 E. Baltimore St.

J. C. DE VRIES, chief engineer of the Phillips Lamp Works, Eindhoven, Holland, arrived in the United States on Sept. 17 to attend the exposition of machine tools at Cleveland.

J. M. HIPPLE, manager of the motor engineering department at the Pittsburgh Works of the Westinghouse Electric and Manufacturing Co., has been appointed works manager of the plant.

R. L. WILSON, works manager of the Pittsburgh Works of the Westinghouse Electric and Manufacturing Co., has been appointed assistant to the vice-president and general manager.

J. DELETAILLE, superintendent of the Fabrique Nationale D'Armes De Guerre, at Liege, Belgium, arrived in the United States on the *S.S. Berengaria* on Sept. 16. He will attend the machine tool exposition at Cleveland.

J. C. ROWETT has been appointed factory district representative for the Foote Bros. Gear and Machine Co., for the state of Minnesota and territory in northwestern Wisconsin. Mr. Rowett will make his headquarters at 406 Sixth Ave., South, Minneapolis.

J. W. BUNTING, president of the Bunting Brass and Bronze Co., of Toledo, is making an extended investigation of European markets with reference to the products of his company. He sailed on Sept. 17 for England, where he will make his headquarters for several weeks.

W. M. FLEMING, of Jacksonville, Fla., who for several years has been identified with the machinery and machine tool business in the Southeastern district, heads a new company organized and incorporated at Jacksonville as the W. M. Fleming Machinery Co., Inc., for the distribution of machinery and equipment in the Southeast.

NEIL C. LAMONT has resigned as manager of the Worthington Works of the Worthington Pump and Machinery Corporation. Mr. Lamont was at one time manager of the Cincinnati Works of the company, and was also in charge of the power and mining works at Cudahy, Wis. In 1924 he was made assistant to the vice-president in charge of engineering and manufacturing.

P. O. GEIER, president of the Cincinnati Milling Machine Co.; GEORGE M. VERITY, president of the American Rolling Mills Co.; GEORGE L. MARKLAND, JR., chairman of the board of the Philadelphia Gear Works; STAUNTON B. PECK, vice-president of the Link-Belt Co.; and HENRY D. SHARPE, treasurer of the Brown & Sharpe Manufacturing Co., are among the manufacturing executives who are members of a committee co-operating with the National Association of Manufacturers in the preparation of a business platform to be presented to the national conventions of the Republican and Democratic parties next year.

Business Items

The Triplex Machine Tool Co., dealer in machine tools, is moving to larger offices at 50 Church St., New York, and will be located in Rooms 1382 and 1383 after October first.

The J. C. Glenzer Co., of Detroit, has added the Wiard chuck to its line, and will manufacture this product which was formerly handled by the American Standard Tool Works.

John Reiner & Co., Inc., of 309 Church St., New York, has been appointed service representative in New York, New Jersey and Connecticut for the Climax Engineering Co., of Clinton, Iowa.

The Hartford Special Machinery Co., of Hartford, Conn., announces that it has established a completely equipped gear cutting department as an adjunct to its business, and is prepared to do contract work in the manufacture of gears and cams.

The Paasche Airbrush Co., of Chicago, announces the opening of a sales and service branch at Cincinnati, under the direction of H. H. Evers. This branch will be known as the Paasche Airbrush Co., of Cincinnati and will be located at Wade St., Flint St., and the Southern Railroad.

The Remington Arms Co., 25 Broadway, New York, which operates manufacturing plants in New York and at Bridgeport, Conn., has announced the election of Saunders Norvell to the presidency of the company, to succeed J. B. Smalley, who has been president for the past 20 months.

Warning

The National Machine Tool Builders' Association has issued a warning to the industry of the presence of an imposter representing himself to be Frank Benson, of Benson Brothers, Sidney, Australia. The man has made a practice of borrowing money from branch offices of machinery companies.

The Diamond Clamp and Flask Co., Inc., of Richmond, Ind., manufacturer of foundry equipment, announces the purchase of the Wayne Works Foundry Bldg., in Richmond. This purchase is a part of the program of expansion in manufacturing and sales facilities. The Diamond Clamp and Flask Co. is now located in the building at 528 North 14th St. Acquisition of the Wayne building will give the company more than four times the floor space they have in their present location.

The LO-HED Hoist Division of the American Engineering Co., announces the appointment of direct factory representatives in Pittsburgh and Cleveland for the sale of its LO-HED mono-rail electric hoists. The Pittsburgh office, whose territory will include western Pennsylvania, West Virginia and counties along the Eastern border of Ohio, is located in the Oliver Bldg., with D. A. Polhemus in charge and John Kaiser assisting. W. C. Minier will direct sales in northern Ohio, except for territory surrounding Toledo, with offices at 2195 Bellfield Ave., Cleveland.

Obituaries

ERNEST W. TAYLOR, treasurer and director of the Starrett Tool Co., of Athol, Mass., died in that city on Sept. 14. He was 48 years old.

GEORGE B. THOMAS died in Bridgeport, Conn., on Sept. 8, after a year's illness. He was mechanical engineer of the Bryant Electric Co., of Bridgeport.

FRANK ELLSWORTH LAMSON, vice-president of the Sessions Foundry Co., of Bristol, Conn., died at his home in that city on Sept. 7. He was 66 years old.

FRANK C. WIGHT, editor of *Engineering News-Record*, one of the McGraw-Hill Publications, died at his home in Summit, N. J., on Sept. 18. Mr. Wight had been a pioneer in the construction industry and was a director of the American Construction Council and a member of the American Society for Testing Materials.

ROBERT FORSYTH, a pioneer in the iron and steel industry died in Chicago on Sept. 11. He was superintendent of the North Chicago Rolling Mill Co. from 1871 to 1883, and manager of the Union Steel Co. from 1883 to 1888. From 1889 to 1896 he was second vice-president and chief engineer of the Illinois Steel Co. Since 1897 he has been engaged in business as a consulting engineer.

HARRY W. GODDARD, prominent in the wire manufacturing business in Worcester, Mass., for nearly 50 years, died on Sept. 8, at his home in that city. He was 64 years old. Mr. Goddard was president of the Hobbs Manufacturing Co., and the Mills Woven Cartridge Belt Manufacturing Co., of Worcester. He was also president of the Springfield Drop Forging Co.

Soviet Metal Industry Plans Expansion

Plans are being drawn for a large development in the Soviet metal industry during the next five years through the erection of new plants, mainly along American lines, to cost $300,000,000, according to an announcement made recently by a delegation of Soviet engineers representing the "Gipromez," the Metal Institute at Leningrad.

The Soviet engineers will remain in the United States for three or four months visiting American plants and consulting American engineering authorities. It is probable that one or more American engineering firms may be engaged to act as consultants for the new construction.

The metal industry is the only manufacturing industry in the Soviet Union with an output still below the pre-war level. During the six months from Oct. 1 to March 31 the output showed an increase of about 40 per cent over the same period last year, and was about 75 per cent of the figure for 1913. During the coming year about $120,000,000 will be spent on major construction in the industry.

Forthcoming Meetings

American Gear Manufacturers Association. Fall meeting, Mount Royal Hotel, Montreal, Canada, Oct. 20, 21 and 22. T. W. Owen, secretary, 2443 Prospect St., Cleveland, Ohio.

American Aeronautical Exposition. First event, under the auspices of a committee of which Major General John F. O'Ryan is chairman; to be held at the 258th F. A. Armory, New York City, Oct. 20 to Nov. 6. Headquarters of the committee, 17 East 45th St., New York City.

American Institute of Steel Construction. Annual convention at Pinehurst, North Carolina, Oct. 25 to 29. Charles F. Abbott, executive director, 285 Madison Ave., New York City.

National Association of Manufacturers. Annual convention, Read House, Chattanooga, Tenn., Oct. 25, 26 and 27. George S. Boudinot, secretary, 50 Church St., New York City.

American Society of Mechanical Engineers. National management meeting, Rochester, N. Y., Oct. 26-27. Charles W. Lytle, chairman, Management Div., 29 W. 39th St., New York City.

National Founders Association. Convention, Hotel Astor, New York, N. Y., Nov. 16-17. J. M. Taylor, secretary, 22 S. La Salle St., Chicago.

American Society of Mechanical Engineers. Annual meeting, Engineering Societies Bldg., New York City, Dec. 5 to 8. C. E. Davies, assistant secretary in charge of meetings, 29 West 39th St., New York City.

National Exposition of Power and Mechanical Engineering. Sixth annual event in the Grand Central Palace, New York, Dec. 5 to 10. Charles F. Roth, manager, Grand Central Palace, New York City.

American Association for the Advancement of Science. Second Nashville meeting, Nashville, Tenn., Dec. 26-31, general headquarters Andrew Jackson Hotel. General chairman, W. S. Leathers, M.D., professor of preventative medicine and public health, Vanderbilt Medical School, Nashville, Tennessee.

The Weekly Price Guide

Rise and Fall of the Market

THERE is measurable improvement in demand this week, for steel rails, bridge structurals, agricultural implement material, and coal mine cars and car bodies. Furnace coke is also moving in larger volume. Copper tubing prices advanced ¼c. per lb. at New York warehouses during the week. Pig-iron prices continue to sag; steel pipe buying appears slow; there are also marked downward tendencies in various descriptions of scrap brass.

(All prices as of Sept. 16)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$21.44
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	25.62
BIRMINGHAM	
No. 2 Foundry	17.75
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.76
Virginia No. 2	27 17
Basic	21.26
CHICAGO	
No. 2 Foundry local	21.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	22.80
PITTSBURGH, including freight charge ($1.76) from Valley	
No. 2 Foundry	20.26
Basic	19.26
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50@4.75
Cleveland	5.00@5.25
Cincinnati	5.00@5.50
New York	5.25@5.50
Chicago	4.75@5.25

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.25	3.50	3.25	3.89
No. 12	2.30	3.55	3.30	3.94
No. 14	2.35	3.60	3.35	3.99
No. 16	2.45	3.70	3.45	4.09
Black				
Nos. 18 to 20	2.80	3.75	3.55	4.00
No. 22	2.95	3.90	3.70	4.15
No. 24	3.00	3.95	3.75	4.20
No. 26	3.10	4.05	3.85	4.30
No. 28	3.25	4.20	4.00	4.45
Galvanized				
No. 10	3.15	4.10	3.95	4.25
Nos. 12 to 14	3.25	4.20	4.05	4.35
No. 16	3.35	4.30	4.15	4.45
No. 18	3.50	4.45	4.30	4.60
No. 20	3.65	4.60	4.45	4.75
No. 22	3.70	4.65	4.50	4.80
No. 24	3.85	4.80	4.65	4.95
No. 26	4.05	5.05	4.90	5.20
No 28	4.30	5.30	5.15	5.45

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv
1 to 3 in. steel butt welded	53%	39%	55½%	43½%	54%	41%
2½ to 6 in. steel lap welded	48%	35%	53½%	40½%	51%	38%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4% less 5%. Cast iron, standard sizes, 36-5% off.

Size, Inches	List Price per Foot	Diameter in Inches — External	Diameter in Inches — Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at warehouse in lots of less than 100 ft. or 100 lb.:

Thickness — Decimal	B.w.g. and Fractions	Outside Diameter in Inches — ⅛	¼	⅜	½	1	1½	1½
		Price per Foot						
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049"	18	.17	.18	.19	.20	.21	.23	.25
.065"	16	.19	.20	.21	.22	.23	.25	.27
.083"	14	.20	.22	.23	.24	.25	.27	.29
.095"	13	.21	.23	.25	.26	.27	.29	.31
.109"	12	.22	.24	.26	.27	.28	.30	.32
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33
.134"	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	....	4.65
Spring steel, heavier	4.00	....	4.00
Coppered Bessemer rods (base)	6.05	6.00	6.20
Hoop steel	4.49	3.65	4.15
Cold rolled strip steel	6.25	6.35	6.25
Floor plates	5.25	5.30	5.00
Cold drawn, round and hex.†	4.00	3.65	3.60
Cold drawn, flats and squares	4.50	4.15	4.10
Structural shapes (base)	3.34	3.00	3.10
Soft steel bars (base)	3.24	3.00	3.00
Soft steel bar shapes (base)	3.24	3.00	3.00
Soft steel bands (base)	3.99	3.65	3.65
Tank plates (base)	3.34	3.20	3.10
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

Electric welding wire, New York, 5/32, 8.35c.; ¼, 7.85c.; 5/32 to ½, 7.35c. per lb. *Flat, 1/16@¼-in. thick. †Shafting and screw stock.

METALS

Current Warehouse Prices in Cents Per Pound for Small Lots

Copper, electrolytic, up to carlots, New York			14.50
Tin, pigs, 5-ton lots, New York			63.87½
Lead, pigs, up to carlots, E. St. Louis 6.00		New York	6.87½
Zinc, slabs, up to carlots, E. St. Louis 6.25		New York	7.12½

	New York	Cleveland	Chicago
Antimony, slabs, ton spot	14.00	16.50	13.00
Copper sheets, base	22.00	22.00	22.00
Copper wire, base	18.75	18.75	15.25*
Copper bars, base	21.50	21.50	21.50
Copper tubing, base	24.00	24.62½	24.00
Brass sheets, high, base	18.25	18.25	18.25
Brass tubing, high, base	23.12½	23.12½	23.12½
Brass rods, high, base	16.00	16.00	16.00
Brass wire, high, base	18.75	18.75	18.75

*Mill

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminium ingots, 98 to 99%, 1 to 15 ton lots	26.00	26@27	26.02
Zinc sheets (casks)	11.00	11.55	10.11
Solder (½ and ½), (case lots)	39.00	40.50	38½@42½
Babbitt metal, delivered, New York, cents per lb.:			
Genuine, highest grade			83.00
Commercial genuine, intermediate grade			61.00
Anti-friction metal, general service			31.50
No. 4 babbitt (f.o.b.)			13.00
Nickel, f.o.b. refinery, cents per lb.:			
Ingots 35.00	Electrolytic 39.00	Shot	36.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Full finished nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled rods, Grade "A" (base)	45.00
Cold drawn rods, Grade "A" (base)	53.00

Base price of Monel metal in cents per lb., f.o.b. Huntington W. Va.:

Shot	28.00	Hot rolled rods (base)	35.00
Blocks	32.00	Cold drawn rods (base)	43.00
Cold rolled sheets (base)	50.00	Full finished sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible copper	11.25 @11.50	10.75	10.00@10.50
Copper, heavy, and wire	10.75 @11.25	10.75	9.75@10.25
Copper, light, and bottoms	9.50 @10.00	9.25	8.75@ 9.25
Heavy lead	5.00 @ 5.25	5.25	4.50@ 5.00
Tea lead	4.00 @ 4.25	3.75	3.50@ 4.00
Brass, heavy, yellow	7.00 @ 7.25	7.00	6.75@ 7.25
Brass, heavy, red	8.75 @ 9.25	9.50	8.75@ 9.25
Brass, light	5.25 @ 5.50	5.50	5.75@ 6.25
No. 1 yellow rod turnings	7.50 @ 7.75	7.00	6.75@ 7.25
Zinc	3.75 @ 4.00	3.25	3.00@ 3.50

TIN PLATES—Charcoal—Bright—Per box

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20	$12.10	$11.95	$11.50
"A" Grade				
IC,	14x20	9.70	9.90	9.50
	Coke Plates—Primes—Per box			
100-lb.,	14x20	6.45	6.10	7.00
	Terne Plates—Small lots, 8-lb. Coating—Per box			
IC,	14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13½	$0.16	$0.15@0.20
Cotton waste, colored, per lb.	.09@ .13	.12	.12@ 17
Wiping cloths, washed white, per lb	15½	36.00 per M	15
Sal soda, per lb	03½	02	02½
Roll sulphur, per lb	027	03½	04
Linseed oil, raw, per 7½-lb. gal., 5 bbl. lots	.86¼	.94	.83½
Lard cutting oil, 25% lard, in 5 gal. cans, per gal.	.65	.50	.50
Machine oil, medium-bodied (55 gal. metal bbl.), per gal.	.27	.35	.29
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin. ft per inch of width for single ply.			
Medium grade	40–5%	40–5%	30–10–5%
Heavy grade	30–10%	30–10%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin. ft.			
First grade	50%	50–10%	50%
Second grade	50–10%	60–5%	50–10%

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0324	$0.0324	$0.0324
Cold drawn shafting	per lb.	.04	.04	.04
Brass rods	per lb	.16	.16	.17½
Solder (½ and ½)	per lb.	.39	.40	.41½
Cotton waste, white	per lb.	.10@13½	10@ 13½	13@.17½
Emery disks, cloth, No. 1, 6 in. dia.	per 100	3.10	3.10	3.10
Lard cutting oil	per gal.	65	.65	55
Machine oil	per gal.	27	27	35
Belting, leather, medium	off list	40–5%	40–5%	40–5%
Machine bolts, up to 1x30 in., full kegs	off list	50%*	50%*	40%

*New list April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
*Flint paper	$5.13	$4.95	$5.13
*Emery paper	10.71	9.15	10.71
*Emery cloth	27.84	27.85	27.84
Emery disks, 6 in. dia., No. 1, per 100:			
Paper	1.29	1.27	1.32
Cloth	3.10	3.05	3.05
Fire clay, per 100 lb. bag		.75	.75
Coke, prompt furnace, per net ton		Connellsville,	3.25@3.75
Coke, prompt foundry, per net ton		Connellsville,	4.25@4.75
White lead, dry or in oil	100 lb. kegs	New York,	13.75
Red lead, dry	100 lb. kegs	New York,	13.75
Red lead, in oil	100 lb. kegs	New York,	15.25

*4½ reams and under.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

	Broken Kegs or Cases	Full Kegs or Cases
Machine bolts, square heads and nuts:		
Up to ¾ x 6-in	50%	50–10%
Larger up to 1 x 30-in	45%	50%
1¼ and 1½ in. dia	30%	35%
Carriage bolts:		
Up to ½ x 6-in	50–10%	
Larger sizes	50%	
Coach and lag screws:		
Up to ½ x 6-in	50–10%	
Larger sizes	50%	
Tap bolts, hexagonal heads	45%	
Nuts:		
Hot pressed, square and hexagonal, blank or tapped	45%	50–10%
Cold punched, square and hexagonal, blank or tapped	45%	50–10%
Semi-finished, hexagonal, tapped, in packages	40%	
Case hardened, hexagonal, tapped, in packages	30%	
Washers: Deduct from list, per 100 lb.	$1.50	$3.50
Rivets, button and cone head:		
Small, including ⅞-in. dia		50–10%
Large (base) per 100 lb	$6.50	$5.00

EXTRA per 100 lb. on rivets: For ¼-in. dia., 35c.; ⅜-in., 15c.; 1-in., 5c.; length 1-in. and shorter, 25c.; longer than 1-in. up to and including 1 ⅛-in., 15c.; longer than 5-in., 25c.; standard countersunk head, 25c.

Machine Requirements and Industrial Construction

Equipment Wanted

Calif., Alameda—Bd. of Education, W. G. Paden, Secy., is receiving bids for machinery and equipment for shop.

Fla., Jacksonville—The Aetna Iron & Steel Co., 2340 Market St.—angle bender, 6 x 6½ capacity.

Mass., Boston — Albany Milling Co., 11 Bristol St.—dove-tail machine.

Mass., Boston—E. L. Sturtevant, 322 Tapen Rd. Brookline—miscellaneous tools and equipment for proposed 2 story garage and service station here. Estimated cost $300,000.

Mass., Cambridge (Boston P. O.)—R. H. O'Neil, 1384 Massachusetts Ave.—miscellaneous tools and equipment for proposed repair and service garage. Estimated cost $40,000.

Mass., Stoughton—M. L. Burt, 295 Lincoln St. 18 in. Black & Decker or Blount, bench grinder, also avery drill press.

Mass., Waltham (Boston P.O.)—P.O. Box 15, Kendal Greenpunch press with 9 in. stroke, etc.

Mich., Detroit—Scott Bros., 418 Macomb St.—machinery and equipment including lathe medium size, planer and welding equipment for metal plating shop.

O., Portsmouth — Ryans Auto Service, Veneer Bldg., C. N. Ryan, Gen. Mgr.—equipment including 24 in. lathe, drill press, heavy press for pulling, etc. for proposed new service station.

Pennsylvania — Sharon Steel Hoop Co., Sharon—machine tools and equipment for proposed additions to plants at Sharon, Pa. and Lowellville, O.

Tex. Mount Pleasant—G. E. Ehrmann & Co., Bank of Commerce Bldg., Memphis, Tenn.—new machinery and equipment for the manufacture of hardwoods for proposed lumber mill here. Estimated cost $75,000.

Opportunities for Future Business

Conn., Bridgeport—A. Abriola, 1998 Main St., is having plans prepared for a 1 story, 100 x 150 ft. garage. Estimated cost $40,000. J. L. Vannucci, 1024 Main St., Archt.

Conn., Bridgeport—F. L. Mills, 2316 Fairfield Ave., awarded contract for 1 story, 100 x 200 ft. garage and service station on Dewey St. Noted Aug. 25.

Conn., Springdale — Stamford Rolling Mills, manufacturers of raw brass, awarded contract for a 1 story, 112 x 215 ft. mill. Estimated cost $40,000. Noted Sept. 1.

Conn., Stamford—Stamford Rolling Mills Co., awarded contract for the construction of a 1 story, 125 x 300 ft. factory.

Ga., Athens—Georgia Plow & Foundry Co., recently incorporated, is reported to be contemplating the establishment of a plant for the manufacture of plows and similar metal products.

Ill. Chicago- A. C. Barrett, 568 West Washington St. manufacturers of expansion bolts, awarded contract for the construction of a 1 story, 49 x 100 ft. factory at 2612-14 Barry Ave.

Ill., Chicago—Coleman Lamp & Stove Co., Wichita, Kan., has acquired a site and plans the construction of a 1 story, 320 x 400 ft. plant at West Sixty Fifth St. and South Laramie Ave. here. Estimated cost $350,000.

Ind., Anderson—Ames Shovel & Tool Co., will soon award contract for the construction of third unit of pickling plant, 3 story, 35 x 60 ft.

Ind., Anderson—Lavelle Foundry Co., had plans prepared for a 3 story foundry on West 64th St. Estimated cost $75,000.

Ind., Bufton—Grimes Co., is having plans prepared for the construction of a brass foundry and pattern shop. Estimated cost $43,000. Private plans.

Ind., Indianapolis—J. D. Adams, 217 South Belmont St., awarded contract for a 1 story, 146 x 263 ft. factory for the manufacture of road graders and machinery. Estimated cost $42,000.

Ind., Kokomo — Continental Steel Corp., H. Roemer, Pres., had preliminary plans prepared for an addition to sheet bar mill.

Iowa — State Highway Comn., Chariton, will receive bids until Sept. 27 for three 1 story 28 x 98 ft. and one 1 story, 28 x 59 ft. maintenance garages at Greenfield, Winterset, Albia and Creston. W. O. Price, Chariton, Dist. Engr.

Ia., Davenport — Merchants Transfer & Storage Co., awarded contract for the construction of a 1 story, 100 x 150 ft. garage and service station. Estimated cost $50,000. Private plans.

Ky., Louisville—J. G. Brown, W. G. Apartments, will build a 2 story, 100 x 300 ft. garage etc. Estimated cost $300,000. P. J. Bradshaw, International Life Bldg., St. Louis, Mo., Archt.

Md., Baltimore—Foster Bros. Mfg. Co., 320 North Holliday St., manufacturers of bed springs, metal beds, etc. plans extensions and improvements to plant to increase the capacity.

Md., Baltimore—Obrecht-Lynch Corp., 316 Light St., plans the construction of a ship repair yard for repair, stationary and boiler work at Key Highway and Lawrence St.

Mass., Brookline (Boston P. O.)—Cadillac Motor Car Co., 2860 Clark St., Detroit, Mich., awarded contract for the construction of a sales and service building at Commonwealth Ave. and Essex St. here. Estimated cost $25,000. Noted Sept. 1.

Mass., Everett (Boston P. O.)—Maltzman & Rovner, 22 Summer St., will build a 1 story, 85 x 140 ft. repair and service garage at Chelsea and Clinton Sts. Estimated cost $40,000. Eisenberg & Feer, 46 Cornhill, Boston, Archts. Noted Feb. 17.

Mass., Lynn — Rinn & Hallgren, 516 Washington St., awarded contract for the construction of a 1 story repair shop.

Mass., New Bedford—Fire Dept., awarded contract for the construction of a 2 story repair shop on Purchase St. Noted Sept. 1.

Mass., New Bedford—W. P. Hammersley, Supt. of Street Dept., will soon award contract for a 1 story machine shop and garage, etc. on Smith St. Estimated cost $50,000. L. LaBroade, 888 Purchase St., Archt.

Mass., Waltham (Boston P. O.)—Industrial Tube Corp., H. J. Lendon, 35 Lane St., awarded contract for the construction of a 1 story, 25 x 180 ft. addition to factory. Estimated cost $40,000.

Mass., Worcester—B. I. Coonan, 6 Tahanto Rd., is having plans prepared for the construction of a garage on Pleasant St. Estimated cost $45,000. G. C. Halcott, 32 Franklin St., Archt.

Mich., Flint — Chevrolet Motor Co., awarded contract for a 1 story, 200 x 500 ft. addition to automobile plant. Estimated cost $150,000. Noted Aug. 25.

Minn., South St. Paul—Exchange Realty Co., 6 West Fourth St., awarded contract for the construction of a 2 story garage. Estimated cost $50,000. Toltz, King & Day Inc., Builders Exchange Bldg., St. Paul, Archts.

N. J., Asbury Park—L. A. Lepsey, 807 Summerfield Ave., plans the construction of a 6 story garage. Estimated cost $150,000. Architect not announced.

N. J., Jersey City—H. Bryne, 392 Mercer St., is having plans prepared for a 1 and 2 story, 200 x 300 ft. garage at Mill Rd., Mercer and Wayne St. Estimated cost $150,000. A. Davis, 140 Montgomery St., Archt.

N. Y., Far Rockaway—Police Dept., will soon award contract for the construction of a garage at Mott Ave. and Mott Pl. Estimated cost $80,000.

N. Y., Rochester—Rochester Auto Parts Inc., Culver Rd., is having plans prepared for a 1 story machine shop, warehouse, etc. at Culver Rd. and Atlantic Ave. Estimated cost $250,000. Leander McCord, Tyler Bldg., Archt.

O., Cincinnati—Daylight Realty Co., 718 First National Bank Bldg., plans the construction of a 5 story, 92 x 280 ft. service station at 6th and Court Sts. Estimated cost $300,000. Kruckemeyer & Strong, 404 St. Paul Bldg., Archts.

O., Cleveland—Cleveland Railway Co., J. D. Alexander, Pres., Hanna Bldg., will receive bids until Sept. 28 for a 3 story, 125 x 125 ft. garage, etc. at East 9th St. and Central Ave. Estimated cost $175,000. Wilbur Watson & Associates, 4614 Prospect Ave., Archts. and Engrs. Noted Aug. 18.

O., Cleveland—Standard Saw Mill Co., K. Fox, Pres., 2705 East 55th St., awarded contract for the construction of a 2 story, 50 x 100 ft. machine shop. Estimated cost $40,000.

O., Elyria—The Colson Co., c/o R. W. Dailey, Engr., manufacturers of trucks and vehicles, is receiving bids for a 3 story, 100 x 192 ft. factory. Estimated cost $125,000. Private plans.

O., Norwalk—W. Lofland, awarded contract for a 1 story, 64 x 102 ft. repair and service garage. Estimated cost $30,000.

Pa., Philadelphia—Central Construction & Supply Co., 2224 Arch St., plans a 3 story, 104 x 156 ft. factory for the manufacture of refrigeration machinery at Belmont and Thompson Sts. Poggi & Winters, Equitable Bldg., Archts.

Pa., Philadelphia—Owner, c/o J. E. Fieldstein, Otis Bldg., Archt., plans the construction of a 1 story, 103 x 215 and 115 x 204 ft. garage at Rochelle and Wissahickon Sts.

Pa., Philadelphia—Ware Bros., c/o P. S. Tyre, 114 South 15th St., Archt., will soon award contract for a 2 story, 95 x 118 ft. sales and service station at 57th and Walnut Sts.

Pa., West Homestead (mail Homestead) — The Mesta Machine Co., Homestead, awarded contract for the construction of a 1 story, 80 x 400 ft. addition to plant here. Estimated cost $40,000.

R. I., Pawtucket — Superior Cabinet Works Inc., R. L. Norstern, 93 Newell St., is receiving bids for the construction of a 1 story, 170 x 250 ft. factory. Estimated cost $40,000. E. G. Bullard & Son, 908 Purchase St., New Bedford, Mass., Archts. Noted March 24.

Tenn., Chattanooga—Broad Street Garage Co., c/o C. T. Jones, James Bldg., Archt., will soon award contract for a 4 story garage. Estimated cost $150,000. Noted Aug. 11.

Tex., Galveston—C. S. Porter, et al, 1115 35th St., plans the construction of first unit of plant for the manufacture of wire and nails, 1 story, 310 x 360 ft. Estimated cost $50,000. Private plans. Noted Sept. 15.

Ont., Toronto—A. D. Gorrie & Co., 354 Victoria St., plans the construction of a 2 story, 50 x 100 ft. garage on Gerrard St. Estimated cost $150,000. Architect not selected.

Ont., Hamilton—Canadian Westinghouse Co., Ltd., Sanford Ave. N., awarded contract for a 2 story, 55 x 262 ft. brass foundry, etc. on Aberdeen Ave. Estimated cost $175,000.